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PRACTICAL GYNECOLOGY

MONTGOMERY

PRACTICAL GYNECOLOGY

A COMPREHENSIVE TEXT-BOOK FOR STUDENTS AND PHYSICIANS

BY

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Second Revised Edition

WITH FIVE HUNDRED AND THIRTY-NINE ILLUSTRATIONS, THE GREATER NUMBER OF WHICH HAVE BEEN DRAWN AND ENGRAVED SPECIALLY FOR THIS WORK, FOR THE MOST PART FROM ORIGINAL SOURCES

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TO

Dr. W. H. Warder,

MY CONSCIENTIOUS INSTRUCTOR AS QUIZ-MASTER AND HOSPITAL CHIEF,
AND MY GENEROUS FRIEND,

THIS BOOK IS RESPECTFULLY DEDICATED.

PREFACE TO THE SECOND EDITION.

In presenting a second edition of this work, I desire to express my sincere gratification over the generous and flattering reception the first edition has obtained from the medical press and the profession.

Many changes have been made in the arrangement of the different divisions which experience has led me to believe will prove of benefit to the student. Malformations are confined to congenital conditions, while the lesions of parturition are treated under the designation of Traumatisms. Disorders of the Fallopian tube and the ovary are more specifically treated in Inflammation. The specific treatment of the various deviations is discussed in close relation with each subject. The division comprising genital tumors has been extensively changed in the consideration of myomata and malignant growths.

It has been my purpose in the entire revision to increase the usefulness of the work to the student by treating, in closer detail, the later operative procedures, and in order to accomplish this the greater part of the work has been rewritten, which has added some seventy pages. The illustrations have been increased in number and many of them redrawn. New illustrations made from material secured from my own practice have been largely substituted for the microscopic drawings of the former edition.

I here take occasion to express my thanks to Mr. H. J. Shannon for the care and painstaking skill with which he has corrected many of the old drawings and constructed several new ones, notably those illustrating the Doyen operation for uterine myomata; to Miss S. L. Clark for drawings of microscopic sections from which the following illustrations were prepared, figures 42 a and b, 113, 117, 119, 120, 282, 285, 286, 288, 292, 293, 482, 483, 499, 500, 501, 515; to Miss Karin M. Hall for drawings for figures 287, 296, 297; to Professor W. M. L. Coplin, M.D.,

for his kind supervision of the preparation of the microscopic drawings and for many valuable suggestions; to Drs. J. M. Fisher, John C. DaCosta, Wilmer Krusen, and C. P. Noble for the loan of specimens from which illustrations were prepared.

I am indebted to Dr. P. Brooke Bland for the preparation of the slides from which the microscopic illustrations were made, for correction of the manuscript, and for assistance with the index; to Miss E. A. Cantner for the rearrangement and preparation of the index and table of contents. The publishers deserve my unstinted praise for their generous expenditure for redrawing the old and in the preparation of new illustrations, and for their purpose to present the work in an attractive form.

It is my sincere hope that this edition shall render the physician more efficient in lessening the ills of women and adding comfort and pleasure to their lives.

PHILADELPHIA, *September 15, 1903.*

PREFACE TO FIRST EDITION.

I will offer no apology for presenting an additional text-book upon gynecology.

This work has been under consideration for the last fifteen years, and much of it has been several times rewritten. An effort has been made to make it a comprehensive work upon the subject, giving the experience and methods of the most careful men, while my own experience has been utilized to indicate that which I have found most useful and worthy of acceptance.

Each general subject is considered with reference to its influence upon the entire genital tract, and the work is divided into sections rather than chapters. This course, although a departure from the ordinary text-book arrangement, is that which experience has demonstrated to be most effective in impressing the subject upon the student, and would seem to me preferable to him who uses the book to refresh his knowledge upon any particular subject. The illustrations are arranged solely with the purpose of rendering clear the text and to promote the work of diagnosis and treatment. For their excellence and character I am greatly indebted to the generosity of the publishers and to the skill and patience of their artists, Messrs. Shannon and Von du Lancken. To the kindly oversight of Dr. Robert L. Dickinson is due much of the exactness of the drawings. Acknowledgment is due Miss Eleanor A. Cantner for her ability in the preparation of preliminary sketches and of the index.

Should it be the means of lightening the work of the student, of making more clear the pathway of the busy practitioner, and, most of all, of benefiting suffering women through improved methods of diagnosis and treatment, I shall feel well repaid for the many days and nights of labor which it has cost

THE AUTHOR.

PHILADELPHIA, *August, 1900.*

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A

TEXT-BOOK OF GYNECOLOGY.

INTRODUCTION.

1. Definition and Antiquity.—Gynecology comprises the study of the diseases peculiar to women. While it is not to be denied that some of the diseased conditions of the female genital tract were known to the ancients, as demonstrated by the description of the sound and of various forms of specula, as well as the directions for the treatment of special conditions, it is certainly true that the most marked development of the science has occurred during the nineteenth century.

2. Theories.—The study of its progress is not without interest and profit, and in its development we witness the pendulum swing from one extreme to the other. The origin of disease is based upon local inflammation by one; by another it is ascribed to constitutional conditions of which the local condition is only an expression. The cervix has been considered the offending portion of the tract, and its inflammation the cause of every trouble. The ovaries have been accused of dominating the other organs, and producing in them secondary or reflex phenomena. Displacements of the uterus, particularly the flexions, have been, and still are, asserted to be the main source of the disorders of the pelvis. To the tubes has been assigned the function of menstruation, and consequently to pathologic lesions of these organs are attributed the majority of abnormal conditions of the genital tract.

3. Foundation.—When we come to analyze the different theories which have been presented, we find the truth is contained not in one, but in a proper combination of all. The influence of the organs upon each other, due to the arrangement of vascular and nerve supply, is significant, and a proper appreciation of the science is attained only by a very careful study and analysis of all the phenomena presented.

4. Purpose.—It should not be considered the true province of gynecology, on the one hand, to ascertain that the patient has

a uterus which must be subjected to the routine use of speculum, sound, and applicator; nor, on the other, that the demonstration of the existence of the ovaries and tubes justifies the conclusion that every symptom of distress or discomfort of which the patient complains must result from a pathologic lesion in them which will of necessity justify their sacrifice. The gynecologist must be one who will be patient in eliciting the subjective symptoms and proficient in determining physical signs, and who will exercise correct judgment in comparing and analyzing the knowledge thus secured; one who has such integrity that the patient may feel assured she will not be treated for diseased conditions which are not present.

He must be so conservative that he will sacrifice no organ whose physiologic integrity is capable of being restored; so bold and courageous that his patient shall not forfeit her opportunity for life or restored health through his failure to assume the responsibility of any operative procedure necessary to secure the object.

5. Difficulties in Study.—The importance of correct diagnosis can not be too strongly affirmed, yet probably in no department of medicine are interposed greater barriers to its accomplishment. In the study of the diseases of women much must depend upon proficiency of touch, which can be acquired only by extensive practice. The delicacy and proficiency of this sense varies so greatly in different individuals that it is difficult to convey an adequate idea of the relative hardness or softness of the structures under observation.

The ovaries and tubes, in which important lesions may occur, are in some patients quite inaccessible to ordinary methods of examination. Pathologic lesions must often, then, be the subject of inference or speculation rather than capable of absolute demonstration. To add to the difficulty of study of symptoms, the mere thought of subjecting herself to examination is repugnant to the modesty of every woman, and the disease occurs in organs so sensitive that they can not be subjected to manipulation by a number of persons in succession. The patients who are willing to be brought before a class of students and subjected to repeated examination are exceedingly few, consequently many practitioners must enter upon their vocation with but little or no practical knowledge of the subject.

6. Observation.—The cultivation of habits of close observation is of the utmost importance. The observing physician will often be able to determine with considerable accuracy the circumstances, condition, and diseased state of the patient from her conduct, manner, and general appearance. Thus, a woman with an abdominal enlargement who enters a physician's office with a face presenting the rosy hue of health, and appears well nour-

ished, would be suspected of suffering from a physiologic rather than a diseased condition, and would be pronounced pregnant; while such an enlargement associated with a pale countenance, an emaciated face, thin cheeks, and sunken eyes would be regarded as indicating an ovarian growth. This special association of the features is known as *facies ovariana*, and is of value in forming the diagnosis. The conduct and deportment of the patient will frequently announce whether she is married or single; her manner of walking or sitting, the existence of a pelvic inflammation.

7. Exercise of Judgment.—Errors in diagnosis are most frequently caused by hasty conclusions founded upon insufficient investigation. The recognition of the existence of some lesion is at once accepted as an explanation for all the distressing symptoms. To be accurate, the judgment should not be given until a careful and thorough examination of every organ capable of producing such symptoms has been made.

8. Value of Notes.—The young physician should accustom himself to taking notes of his office cases; he thus forms the habit of more careful and systematic investigation of every patient, accumulates data from which he is enabled to formulate more definitely judicious plans of treatment, and, probably most important of all, has the means of refreshing his mind from time to time as to the condition of any particular patient.

9. History.—Such a schedule should comprise the *name*, *residence*, *age*, *condition of patient*, *married or single*, *family history*, *personal history* (as previous sickness, duration of present illness, supposed cause, progress and symptoms).

Menses: first appearance, regularity, duration, what changes have since occurred; present habit, date of last menstruation.

Pain, whether it precedes, accompanies, or follows the periods, its character, severity, and where experienced.

Leukorrhea: amount of discharge, duration, continuance, color, consistence, and effect upon the parts with which it comes in contact.

Number of children or miscarriages: character of labor and convalescence and the influence upon subsequent health.

Coition: painful, sensation, frequency, methods employed to avoid conception.

Interrogation of other organs: regularity of alvine dejections, frequency of micturition, digestion; pain in head, in lumbar region, in groins, down the limbs, etc.

The inquiry need not, possibly should not, in all cases pursue the order here laid down. In some instances it will be better to permit the patient to tell her own story; in others it will be necessary to guide her course by an occasional judicious question, or

to assume the position of questioner, and patiently endeavor to secure a complete history. While the appearance and the character of the symptoms may indicate a certain interpretation, the physician should reserve his judgment as to the condition until the testimony of subjective and objective symptoms has been completely secured, and then arrive at the diagnosis after their careful analysis.

DIAGNOSIS.

10. Subjective Symptoms.—The subjective symptoms are those which are elicited from the patient or her attendants. As already asserted, the difficulty experienced in determining the physical signs frequently made these symptoms of great value. Every such symptom, however, must be carefully weighed, as both patient and attendants may exaggerate the character and severity of symptoms or err in observation and in interpretation.

11. Causes of Error.—Lisfranc * writes: "By their almost latent state, their great variety of symptoms (often very transitory), their sympathetic effects on all parts of the economy, and their immense influence on the nervous system, uterine diseases are peculiarly apt to lead medical practitioners into errors of diagnosis."

The reason for these errors is the difficulty in understanding their cause. The uterine symptoms are not always the most prominent, are slowly developed, and do not always attract the attention of the patient. Not infrequently is the physician consulted for disorder of the stomach, of the heart, or of the liver; for vomiting, nausea, want of appetite, or diarrhea; for neuralgia or hysteria; for a train of evils having their origin in poverty of the blood, as chlorosis, anemia, emaciation, and exhaustion—all of which may be symptomatic manifestations of an obscure uterine malady.

12. Method of Procedure.—The examination should proceed from general to local symptoms in such a manner as to bring the patient to the conviction, at which the physician has already arrived, that the only logical outcome is a physical examination.

13. General Symptoms.—There are many cases of disease in which the general or constitutional symptoms are very predominant, so much so, indeed, as to wholly obscure the diagnosis and lead both patient and physician to believe that organs other than those of the pelvis are directly at fault. The symptoms of which complaint will be most frequently made are *gastric*, such as gastralgia, nausea, vomiting, perverted appetite, anorexia, and

* "Clinique Chirurgicale de la Pitie," vol. II, p. 182, Paris, 1842.

regurgitation associated with a clean tongue. Nausea and obstinate vomiting are very likely to be associated with ovarian disease. *Nervous anesthesia* affects portions of the lower extremities, as over the front of the thighs. It is especially prone to extend to and involve the clitoris, genitals, and vagina, when all sexual desire and pleasurable sensation during coition become lost.

14. Visceral Neuralgias.—The bladder and rectum are not alone the seat of pain, but remote organs are also affected, such as the liver, stomach, intestinal canal, and heart. Patients not infrequently suffer from symptoms which cause them to believe themselves the victims of a serious disorder of the heart, which entirely disappear upon proper treatment directed to a pelvic lesion.

15. Neuralgia in the lumbar and dorsal regions,—intercostal neuralgia of the left side,—leading the patient to fear the existence of organic heart disease, is common. The *trifacial nerve* may be involved, producing the sensation of a nail being driven into the head. *Sympathetic pains* are frequently noticed in the heart, with a sensation of swelling, especially marked during menstruation. I have often observed intense pain felt in the breast associated with a chronic inflammation of the corresponding ovary. The pain is usually ameliorated or absent during menstruation, but aggravated during the menstrual intervals.

16. Motor and sensory paralysis is not an infrequent concomitant of uterine disorder. It is often difficult to determine its cause. It is usually of a hysteric character, and numerous cases have been recorded where the replacement of a displaced uterus has resulted in the rapid cure of a case of complete paraplegia.

17. Disorders of Nutrition.—These may be the result of the gastric phenomena resulting in impoverished conditions of nutrition, such as anemia, chlorosis, and general debility.

18. Chlorosis is found in poorly nourished girls, who suffer from it at puberty, or in women during pregnancy, and is frequently developed by, rather than originates, the pelvic disorder.

19. Anemia is most frequently found in older women who are suffering from some serious disease, as cancer, fibroid tumors, or other growths which have caused repeated and profuse hemorrhages; consequently it is more a symptom than a morbid affection, and results from the presence of disease. When repeated hemorrhages have led to impoverishment of the blood, and have removed needful materials for repair, or when the patient has been weakened by suppuration and insufficient assimilation, there is loss of color in the skin, transparency of the tissues, local edema, frequent weak pulse, and general debility. These diseases of nutrition are accompanied not only by general debility,

but also by progressive emaciation, until the disorder producing them has been properly treated. Under the influence of the diseased condition the patient becomes prematurely aged. The head is stooped, the limbs are bent, the features are drawn, and she presents a look of suffering; the flesh is soft and flabby; the countenance is expressionless, the complexion pale and faded, especially when leukorrhea has been long continued and profuse. The paleness is different from that of ordinary anemia; it causes the characteristic appearance that has been recognized under the name of *facies uterina* (Courty). Emaciation may not always be present; on the contrary, the patient may sometimes be corpulent, particularly when amenorrhea, rather than leukorrhea or hemorrhage, occurs. The obesity is sometimes so great as to lead the patient to believe herself pregnant, and not infrequently, while suffering severely, she is congratulated by her acquaintances upon her excellent appearance.

20. **Local Symptoms.**—The local symptoms are those sensations which are experienced in the genital organs or in those organs immediately associated with them. The latter are more particularly the rectum and bladder. Reflex phenomena from the rectum or bladder, or, on the contrary, sympathetic irritation of the uterus, when either of the former organs is the seat of disease, are very common, and the frequency of their occurrence can be appreciated when we remember that the nerve supply to the uterus, rectum, and vagina is derived from the cervico-uterine ganglia of the hypogastric plexus.

21. **Rectal Reflexes.**—It is not unusual to find that during menstruation women suffer from *diarrhea*. The pelvic vascular system is so general that engorgement or inflammation of the uterus will not fail to produce congestion in the other pelvic organs; and in any marked inflammation of the organ, associated with displacement, and particularly in retrodisplacements, the hemorrhoidal vessels will be found to be distended; thus, *hemorrhoids* in the female very frequently result from the presence of retrodisplacements of the uterus, and these should never be subjected to operative treatment until the displacement has been corrected. In anteversion the cervix will frequently be found to project against the anterior wall of the rectum, and can be readily distinguished through this viscus. When the cervix is inflamed, the impingement of hard fecal matter against the organ not infrequently causes severe pain. In some cases this pain is experienced only during menstruation. The most frequent functional disorder of the rectum is constipation; partly from neglect, and partly from want of nerve irritation, the bowel becomes filled with fecal matter, the watery portions are absorbed, and hard, dense, scybalous masses form, which are evacuated with difficulty, and

possibly only after repeated enemata. The muscular coat of the bowel becomes distended, loses its tone, and results in a form of paralysis; fecal matter undergoes decomposition, is partly reabsorbed, and causes the condition which Barnes has denominated as *copremia*, in which the skin is of a sallow, dirty hue, presenting ill-smelling secretions; the patient suffers from dyspepsia, flatulence, and pyrosis—a condition akin to that known as uremia. The violent efforts at evacuation of the bowels lead not only to the formation of hemorrhoids, fissure, sometimes fistula, but they may, through the increased intra-abdominal pressure, cause displacement of the uterus and the vagina. When fissures exist, the pain during defecation is so great that the patient is likely to permit the bowels to go unevacuated rather than endure the resultant pain.

22. Vesical Reflexes.—The relation of the bladder to the uterus is still more intimate than that of the rectum, and consequently this organ is more likely to be affected in inflammatory conditions of the uterus. Retention of the urine may be produced by pregnancy or by pelvic growths, such as fibroid tumors or tumors of the ovaries. It sometimes occurs, also, as a result of irritation of the orifice of the vagina, a condition known as *vaginismus*. The pain may be so great as to produce a spasmodic contraction of the sphincter of the bladder. The most usual functional derangement of the bladder, however, is *frequent micturition*. It may occur as the result of reflex irritation from the pelvic organs, or in consequence of pressure from the uterus, produced by the presence of a tumor or by a pregnant uterus or a displaced organ in which either the fundus rests forward upon the bladder or is turned backward, causing the cervix to press against the latter. Either of these conditions may lead to functional derangement of the bladder, so marked as to cause the patient to suspect the existence of disease of that organ, or, as she will more probably say, disease of the kidneys.

23. Genital Symptoms.—The symptoms attributable to the genital organs are derangements in the performance of their functions. The particular symptoms are disturbances of menstruation, such as a decreased, an increased, or an irregular menstrual flow, the existence of sterility, the presence of pain and excessive discharge; consequently, in determining the history of the patient, if she is married, we endeavor to elicit information regarding previous pregnancies and the character of the labors. *Sterility* in a woman who has been married for a number of years is an indication of some abnormal condition. It may be due to a malformation, to functional disturbances, to actual disease, or to efforts to avoid the responsibility of maternity. It should be remembered, however, that there are cases of relative sterility.

The most unvarying function of the uterus is that of menstruation, consequently some disturbance in the perfomance of this function is one of the first indications of the existence of uterine disorder. *Amenorrhea* is a term used to signify absent or greatly decreased menstrual flow; in *menorrhagia* the flow, though regular, is increased, and the menstrual period is lengthened. *Metrorrhagia* is a term employed to designate a flow that does not correspond with the regular periods. *Dysmenorrhea* indicates the existence of pain occurring at the beginning of, during, or immediately following the menses. These conditions will be considered more fully later.

24. Hemorrhage is by no means a constant symptom of uterine disease. Its significance varies according to the amount of blood lost and the time of life at which it occurs. During the earlier periods of menstrual life it is not uncommon for the menses to be very profuse, caused by defective development of the ovaries or ovarian hyperemia. When hemorrhage occurs in women who have borne children, it may be produced by inflammation of the mucous membrane of the uterus—hence a hemorrhagic endometritis; or in women at a more mature age, it may result from villous degeneration of the endometrium (Goodell), a condition demanding careful investigation to discover or exclude malignant disease. Hemorrhage is very commonly associated with fibroid growths of the submucous variety. *Uterine polypi*, whether due to a fibroid growth or to vascular growths upon the endometrium, are a very prolific cause near the climacteric. The occurrence of hemorrhage subsequent to the menopause should always cause the physician to suspect the possibility of malignant disease in either the mucous membrane of the cervix or the body of the uterus. When hemorrhage occurs during or following pregnancy, it is probably due either to a threatened abortion or to retention of portions of the fetal envelopes. It should not be forgotten, however, that hemorrhage may occur from cystic disease of the ovaries, and in some cases in which the pelvic organs present no lesion, as from valvular disease of the heart, Bright's disease, and obstruction of the portal circulation of the liver.

25. Pain is a very frequent symptom; it may be associated with the menstrual function, when it is known as dysmenorrhea, or may be independent of it. When it occurs during coition, it is known as *dyspareunia* (Barnes). It may be dependent upon, first, vaginismus; second, chronic nervous irritability due to incomplete or awkwardly performed first coitus; third, inflammation; fourth, tumors; and fifth, malformations.

26. Seats of Pain.—Courty assigns six seats of pain, three of which are principal and three accessory. The principal seats

are, first, the iliac regions; second, the loins; and, third, the hypogastrium.

27. The iliac pain is the most frequent; it is felt in the region of the iliac fossa, and extends from it to the hypogastric and lumbar regions, particularly toward the pelvic brim and cavity. This pain is most often felt upon the left side. It is probably due to tension of the broad ligament, and occurs upon the left side more frequently on account of the arrangement of the circulation through the veins. The left ovarian vein enters the left renal at a right angle, and passes behind the sigmoid flexure of the colon to reach it. The frequent impaction of this portion of the gut with feces would account for the obstructed circulation.

Courty ascribes pain in this region, however, to the inclination of the uterus to the right; hence any increase in size of the organ causes a gradual dragging upon the left broad ligament.

28. Lumbar pain, generally spoken of as backache, is felt in the lower part of the lumbar region, sometimes extending to the region of the kidneys, and, in others, and more frequently, down over the sacrum. In some cases the abdomen is encircled as with a belt of pain. This pain is usually ascribed to traction upon the uterosacral ligaments. It is doubtless not infrequently due to retention of secretion within the cavity of the uterus, by which that organ is obliged to go into labor in order to secure its expulsion. Its presence indicates disease of the cervix; when it is particularly marked in the sacrum, it is the probable result of retrodisplacement of the uterus.

29. Lateral Pain.—Pain felt upon either side of the pelvis, recurring or intermittent in character, is frequently due to the effort of an inflamed Fallopian tube to expel its retained secretions into the uterus.

30. Hypogastric pain is experienced above the pubes, and, more than any other, seems to have its origin in the uterus. It is artificially elicited, rather than occurring spontaneously. Patients who do not experience it ordinarily, complain as soon as pressure is made over the lower portion of the abdomen. This pain is greatly aggravated in walking, so that the patient not infrequently experiences the necessity of support over the hypogastrium by means of a belt or by placing the hands in front, partly for support and partly for protection against injury.

31. The accessory seats of pain Courty ascribes first to the anus or perineum; second, to the vagina or cervix; and, third, to the cavity of the pelvis.

32. The anal or perineal pain is usually produced by a retrouterine tumor or retroflexed uterus. Patients with hypertrophy of the cervix not infrequently suffer pain in the anus or perineum while walking or riding, and often when sitting.

33. Vaginal pain is not so frequent. It is felt in women who have inflamed uteri, particularly during an orgasm.

34. Pelvic pain results usually from inflammation about the uterus or from inflammation of the tubes, fixation of the ovaries, or when organs have become cystic or the seat of pus collections.

35. Leukorrhea.—Leukorrhea, or whites, is a term given to discharges other than sanguineous that occur from the genital tract. To appreciate its significance as an indication of disease, we must recognize the character of the normal or physiologic secretion.

36. The secretion from the Fallopian tubes and cavity of the uterus is a thin, whitish alkaline fluid; that from the cervical glands is also alkaline, but is very viscid, tenacious, and transparent like white of egg.

37. The secretion of the vagina and vulva is whitish, made up of a serous fluid intermixed with scaly epithelium. The vulvar discharge also contains oil-globules from the sebaceous glands. The secretion of both vagina and vulva is acid.

The superfluous discharge from the cervix is coagulated by that of the vagina, forming a smeary material at the upper part of the vagina, and will be found to coat over the surface of a pessary. When the cervical fluid is in excess, it may pass from the vagina unchanged and perfectly transparent.

Another discharge or secretion is that which takes place from the vulvovaginal glands during coition or under excitement. This is a clear, viscid discharge. In very erotic women this discharge is ejected upon the approach of a person of the opposite sex, and nocturnal discharges occur during erotic dreams.

It is sometimes difficult to determine whether a discharge is the result of over-stimulation of a physiologic secretion, or is produced by a pathologic condition.

38. Catarrhal Discharge.—A profuse discharge is not an infrequent result of exposure to cold. An increased secretion from the uterine glands occurs instead of the ordinary nasal flow. A hypersecretion which results from the hyperemia of the pregnant uterus may be considered physiologic.

In some undeveloped and strumous young women a leukorrhea occurs as a substitute for the menses. In many individuals a slight leukorrhea, preceding or following the menses, has no abnormal significance.

39. Origin of Discharge.—The source of origin of an abnormal discharge can be determined to some degree by its appearance and character. When from the cavity of the uterus, it will be a thin, watery fluid, loaded with ciliated columnar epithelium, and containing also pus and blood-corpuscles, according to the extent of the disease.

40. Discharge Simulating Abscess.—It may be a continuous flow, but more frequently it is intermittent, due to obstruction from swelling of the mucous membrane of the outlet, which leads to dilatation of the cavity and not infrequently of the orifices of the tubes. The uterus then empties itself only by occasionally going into labor to evacuate its contents. Such a fluid, loaded with pus and blood-corpuscles, coming away in gushes, leads the patient to believe that an abscess has formed and been evacuated. Patients will not infrequently inform you that they have abscesses form and discharge at short intervals. The conditions described, however, may not be the only explanation. An accumulation in a tube, the uterine end of which is still patulous, may occasionally drain through the uterus. Such a condition has been denominated *hydrops tubæ profluens*.

41. Other sources for purulent discharges are found in the rupture of a tubal or peritoneal abscess into the vagina; the rupture of a suppurating ovarian tumor, of an extra-uterine pregnancy sac, or of an abscess about the vermiform appendix.

42. Cervical Discharge.—The discharge from the cervix is usually very viscid and tenacious; it may be clear and transparent, or clouded by desquamated epithelium and filled with pus-cells, when it is yellowish or greenish-yellow in color, or it may be mixed with blood-corpuscles.

The cervix will usually be dilated and patulous, its membrane thickened, abraded, and covered with papillæ.

43. Vaginal Discharge.—A thin, serous discharge flows from the vagina in simple inflammation; in more severe attacks it is loaded with epithelium, and the vagina is red and inflamed and has apparently shed its entire epithelial coat. When due to gonorrhea, the discharge is profuse, purulent, ichorous, irritating to the external parts, and attended with a burning sensation during micturition.

44. Effect of Age upon the Discharge.—The significance of the discharge is also dependent upon the age and physical condition of the patient. Prior to puberty it is usually due to irritation of the vulva, and is thin and serous, resembling that from eczema. After puberty, in the unmarried, it is generally vaginal. In the more mature and in married women it is usually uterine.

As the individual approaches puberty the vulvar discharge becomes more oleaginous, from the secretion of the sebaceous follicles. Not infrequently, in uncleanly persons, the secretion from these glands is so abundant that it decomposes and sets up an inflammation similar to the blennorrhea of the male. Prior to or following the climacteric a thin, watery flow, of a sweetish, sickening, or decayed-flesh-like odor, should be considered a strong premonition of cancer of the uterus.

45. Physical Signs.—The careful study and analysis of the subjective phenomena may afford an approximate idea of the disorder present, but the diagnosis should not be considered completed until the objective symptoms, or physical signs, have been investigated.

46. Senses Employed.—In the study of the physical signs all the senses except that of taste are employed:

The sight is used in inspection of the abdomen and external genitalia and in examining the internal organs by the use of the speculum.

The touch is practised in abdominal palpation and percussion, in simple vaginal or rectal touch, in conjoined manipulation, and in the use of sound or catheter.

The hearing is employed in percussion and auscultation.

The smell is exercised in the examination of discharges.

47. Examination.—The physical signs are recognized through an examination, which may be abdominal, pelvic, or a combination of the two in the bimanual or conjoined manipulation.

48. Pelvic examination comprises inspection, touch, and instrumental investigation.

49. Abdominal examination may be classified under inspection, palpation, percussion, auscultation, and exploratory puncture or incision.

50. Preliminaries.—The verbal examination should have been so conducted that upon its completion the patient will be impressed with the fact that a physical examination is the only logical conclusion. The examination may be made upon a sofa or a common bed, as would be the custom when made at the home of the patient; but in office practice it will be found more convenient to have provided a suitable table or chair. The choice of table will depend upon the custom and convenience of the operator. One made by Codman & Shurtleff, of Boston, known as the Chadwick table, is very satisfactory. (Fig. 1.) In the first examination for the consideration of obscure conditions the clothing should be loosened and corsets removed, so that the abdominal walls can be completely relaxed. The bladder and rectum should be empty. The latter suggestions are very important in order to permit the normal

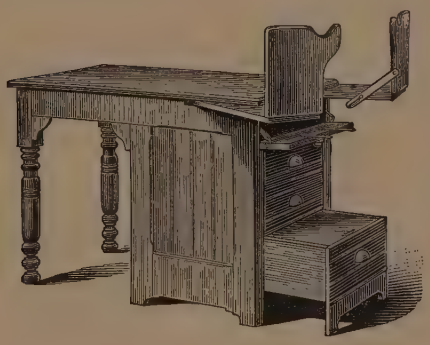

Fig. 1.—Chadwick Table.

relations of the uterus and its adnexa to be determined. Fecal accumulations have been mistaken for ovarian and tubal enlargements or inflammatory exudates. A distended bladder has been confounded with an ovarian tumor. The patient should be so placed for examination that the pelvis will be exposed to a good light.

51. Positions.—The patient may be placed in one of six positions for examination: viz., (1) dorsal; (2) lateral; (3) semiprone (Sims); (4) genupectoral; (5) Trendelenburg; (6) erect. Of the positions named, the dorsal and semiprone are the most important.

52. The Dorsal Position.—The patient lies upon her back, with the limbs flexed and feet placed upon supports. The feet may be on a level with the buttocks or placed on supports a foot higher. The latter affords greater relaxation to the abdominal muscles. The clothing is lifted over the knees. The lower part of the body has been previously covered with a sheet, which is folded about the widely separated limbs, and permits the inspection of the vulva. (Fig. 2.) This position permits the ready practice of the bimanual examination, and is the most favorable for vaginal and abdominal palpation and for the use of the valvular and Edebohls' specula.

Fig. 2.—Dorsal Position.

53. The Lateral Position.—The patient lies upon the left side, with the limbs at a right angle to the body. This position was formerly much used by English gynecologists, and was preferred because it permitted examination to be made without danger of touching the tender structures at the anterior part of the vulva. This position was thought less vulgar, and it allowed the finger to follow more readily the curve of the sacrum and to reach with greater ease the highly situated cervix. Its chief advantage, however, is in permitting more minute investigation of the lateral fornices of the vagina. In abdominal palpation it affords increased opportunity to recognize changes of position of tumors and displacements of the viscera, particularly of the kidney.

54. The Semiprone or Sims' Position (Fig. 3).—The patient is placed upon the left side and chest, with the left arm behind

Fig. 3.—Sims' Position. Proper Method of Holding the Speculum.

her, the left leg partly extended, the right being flexed at a right angle to the body. The intra-abdominal pressure is neutralized.

Fig. 4.—Genupectoral Position. Organs Shown in Outline.

The mobility of the uterus is readily determined, replacement more easily accomplished, and some anteflexions recognized as

the organ falls forward that are not apparent in any other position. The chief value of the position is in the use ot the Sims' speculum.

55. The genupectoral position (Fig. 4), also called the knee-chest position, is one in which the patient rests upon the chest and knees. The left side of her face rests upon her left hand. The

Fig. 5.—Trendelenburg Position.

thighs are at right angles to the surface of the table. The chief value of this position is in replacing a retrodisplaced uterus or prolapsed ovary, or for elevating from the pelvis a more or less impacted tumor.

56. The Trendelenburg Position.—The patient lies upon her back and on a plane inclined at an angle of 45 to 60 degrees, with

the feet and legs over a flap of the table (Fig. 5). Heavy patients should have additional support by the application of shoulder pieces. This position can be utilized for examination of the pelvic viscera, but it is of more service in some operations upon the pelvic contents, for with the patient in this position, the intestines recede and light enters directly into the pelvis. It is of special value in the inspection of the bladder through the urethral speculum or cystoscope.

57. The erect position is of limited application. The patient stands with feet separated, with one hand resting upon the shoulder of the physician, while he sits or kneels before her and introduces the index-finger into the vagina. The chief value of this position is in determining the amount of downward displacement of the pelvic contents and in securing ballottement in the early stages of pregnancy.

PELVIC EXAMINATION.

58. Inspection.—The patient is placed in the dorsal position. (Section 52.) In the first examination of every patient a visual examination should always precede the practice of touch. By carefully arranging the clothing this can be done without shocking the sensibility of the most modest. It affords information as to the cleanliness of the patient; the presence of pediculi; venereal warts or sores; malformations; traumatisms; eruptions upon the vulva; tumors of the labia majora; elongation and thickening of the labia minora; hypertrophy of the clitoris; elongated or adherent prepuce; lacerations of the perineum; presence of hemorrhoids, ulcerations, or fissures; urethral caruncle; anomalies of the hymen; cystocele; rectocele; prolapse of the uterus; and the quantity and character of vaginal discharge. Inspection may be a simple preliminary to the touch.

59. Simple Touch.—The pelvic floor presents three apertures or perforations: the urethra, the vagina, and the anus—through either one or all of which an exploration may be made. The vagina is the route usually chosen as affording the best opportunity for securing the most extended information.

60. Preparation.—The hands should be carefully cleansed. Independent of any possible danger of conveying infection, the educated woman will be doubtful of the physician who proceeds in her examination with unclean hands and nails. The latter should be cut close. Either hand may be used in examination. In some cases it may be desirable to use first one and then the other. When the vagina is sufficiently roomy, two fingers should be introduced. This affords additional length and surface for

touch. The fingers should be lubricated with soap or some unguent, such as carbolized alboline. The soap is preferable, for in washing it is removed with the secretions; but with some patients, however, it aggravates any existing irritation.

61. Procedure.—The physician with one hand separates the vulva in order to avoid carrying up the hair, and proceeds to make the digital investigation. Pressing back the perineum, the finger or fingers more easily enter, and without impinging against the anterior delicate structures. The unemployed fingers of the hand should be carried back extended, as closing them shortens the distance accessible to touch. (Fig. 6.) This procedure affords information as to the presence of cysts in the labia; the

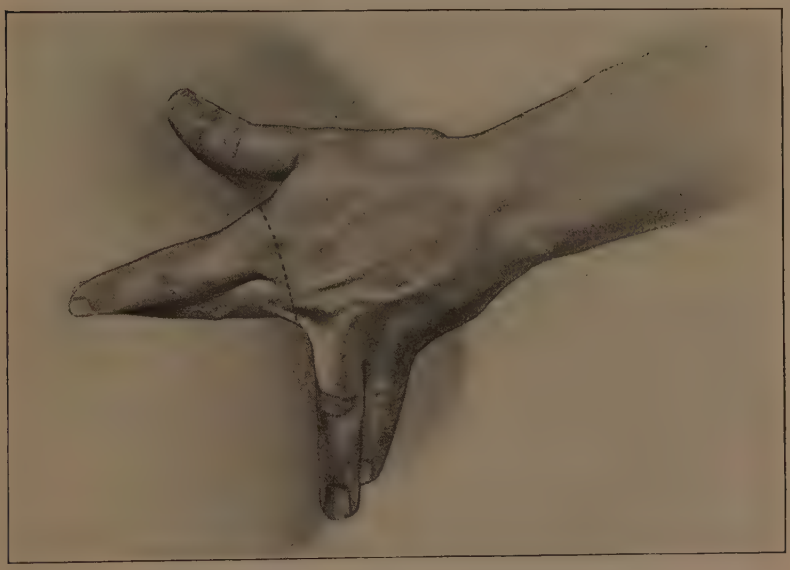

Fig. 6.—Proper Position of Fingers for Examination.

size of the vagina; relaxation of its walls; condition of its mucous membrane; amount of secretion; the contents and tenderness of the rectum; inflammation and projection of the urethra; tenderness, prolapse, and distention of the bladder; and relation of the uterus to the vaginal axis. In its normal position the cervix looks backward, the axis of the uterus being nearly at right angles to that of the vagina. The situation, size, and density of the cervix are recognized. It may be normal, may be lacerated on one or both sides, or may present a number of fissures—a stellate laceration. Its lips may be soft and velvety, from enlarged papillæ; nodular, from enlarged or cystic Nabothian glands;

widely everted and dense, from chronic inflammation following laceration; enlarged and indurated, from chronic inflammation or malignant infiltration; enlarged, friable, or excavated in epithelioma. The os will be a slightly transverse depressed dimple

Fig. 7 (also Fig. 109).—Half Section of the Pelvis with Patient Erect, Showing Normal Position of the Uterus.—(*Deaver.*)

when normal, or when abnormal, will be fissured laterally, bilaterally, through the anterior or posterior lip, or in a number of directions. It may be firmly closed or may stand open to such a

degree as to admit the finger. The spaces about the vaginal projection of the uterus are known as the fornices. The posterior fornix is the deeper; the anterior is slight. The resistance and density recognized indicate the existence or absence of inflammation. A mass in the posterior fornix, if continuous with the cervix, the axis of which is parallel to that of the vagina, is a retroversion of the uterus. If there is an angle between it and the cervix, the condition may be a retroflexion of the uterus, a tumor of the posterior uterine wall, an enlarged ovary or tube, or an inflammatory exudate. Digital examination also affords an idea of the mobility of the uterus, but the investigation is confined to the lower segment.

62. Bimanual procedure, also called the conjoined manipulation, or vagino-abdominal touch, affords more definite information. In every examination the introduction of one or two fingers into the vagina should be associated with the application of the fingers of the other hand upon the abdomen. The external hand may be placed about midway between the symphysis and umbilicus, pressing downward upon the anterior abdominal wall. It may be moved from one side to the other, in order to examine the contents of the pelvis. This procedure enables us to outline the size, shape, density, and situation of the uterus, and to determine the presence of growths in its walls and its relation to other pelvic growths or to inflammatory deposits. The normal tube is rarely palpable. When it is readily perceived, it is the result of an inflammatory condition. The ovaries are more easily recognized. To arrive at a definite conclusion in an obscure case, it is better to introduce into the vagina the fingers of the hand corresponding to the ovary to be palpated, as the extreme rotation necessary to bring the sensitive surface of the finger in contact with a small mass diminishes the sense of perception. (Fig. 8.)

63. Difficulties.—The bimanual examination is rendered difficult by a large deposit of fat in the abdominal wall and by rigidity of the abdominal muscles. The latter is sometimes so marked that the patient can not relax the muscles, and the determination of the pelvic condition is unsatisfactory. When this is due to nervousness, much can be accomplished by allaying the patient's fears and securing her coöperation. Have her breathe with the mouth open, fill her lungs, and then expel the air, while the hand over the abdomen depresses the wall during expiration, and thus secures an outline of the pelvic organs. The procedure may sometimes be rendered less difficult by diverting the patient's attention through inquiries regarding other symptoms. When the resistance can not be overcome, or the sensitiveness arises from an inflammatory condition, or the abdominal walls are very fleshy, an anesthetic may be necessary.

64. Virgins.—It is often a serious question to determine when an examination should be made upon a young unmarried woman. It should be the rule to avoid such an examination, unless the symptoms are of such a character as to indicate the existence of conditions which endanger her health. The regular occurrence of menstrual molimina, without the appearance of bloody discharge, after the age when puberty should be expected, must be considered an indication for a physical investigation. In many

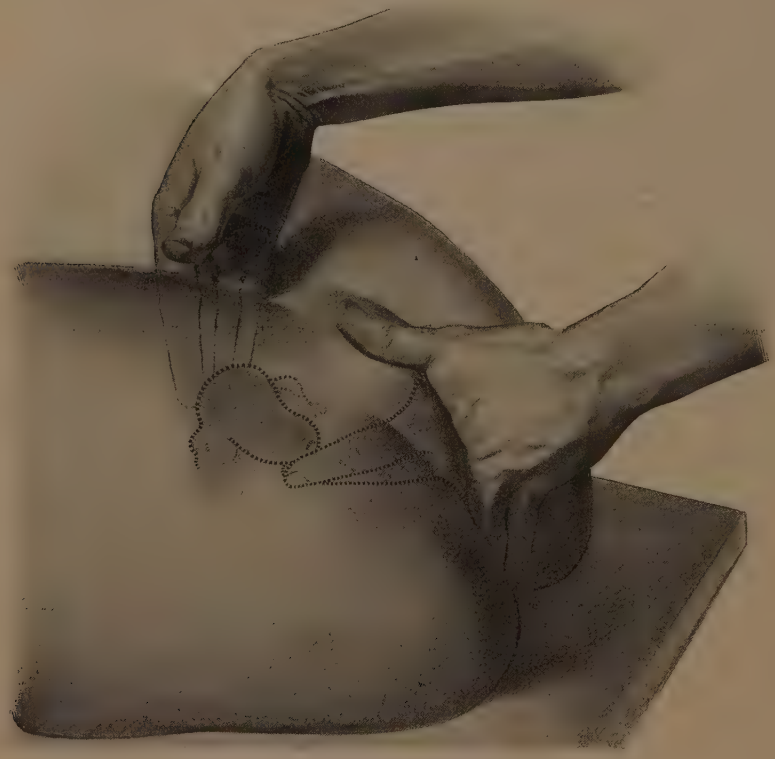

Fig. 8.—Bimanual Examination.

patients requiring a digital examination the procedure can be accomplished through the rectum.

65. Rectal Touch.—(The rectal touch, recto-abdominal [Fig. 9], rectovagino-abdominal, or rectovesical touch.) The routine practice of digital examination by the rectum in the first investigation of a patient is to be commended. The finger should be carefully washed after removal from the vagina and before its introduction into the rectum, and vice versa. Neglect of this

precaution may lead to a severe proctitis from the introduction of infectious material. The anointed finger, first directed forward, and after its entrance carried backward, is gently rotated. It enables us to recognize the condition of the rectum; the presence of fissures; hemorrhoids, ulcerations; contractions of the sphincter; sensitiveness of the coccyx; encroachment upon the bowel by the uterus; the condition of the posterior surface of that organ; the presence of inflammatory exudate in the pelvis; malignant infiltration of the broad ligaments or peritoneum;

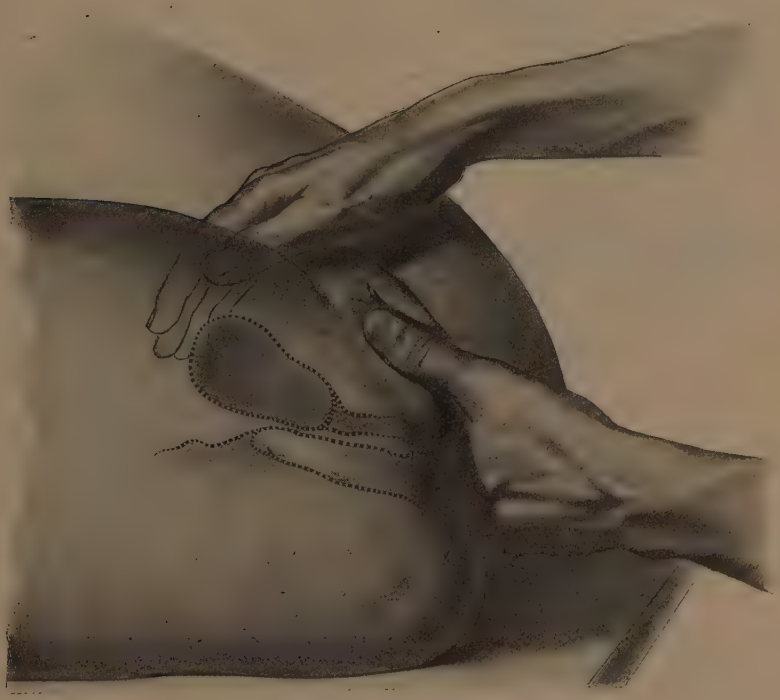

Fig. 9.—Recto-abdominal Palpation.

and the position of the uterus, when we desire to avoid a vaginal examination of the virgin. The rectal procedure promotes the replacement of the displaced organ. The correction of malpositions is facilitated by the introduction of the middle finger into the rectum and of the index-finger or thumb into the vagina. (Fig. 10.) The conjoined rectal manipulation is known as the recto-abdominal, the rectovaginal, the rectovagino-abdominal, or the rectovesical, according to the position of the fingers of the two hands. The absence or presence of the uterus in congenital

atresia vaginalis may be determined by rectovesical touch; that is, the introduction of the finger into the rectum and of a sound (Fig. 11), bougie, catheter, or finger of the other hand through the urethra. It is rarely that it will be necessary to explore the bladder with the finger.

66. Simon's method consists in the introduction of the whole hand into the bowel, and is capable of affording additional in-

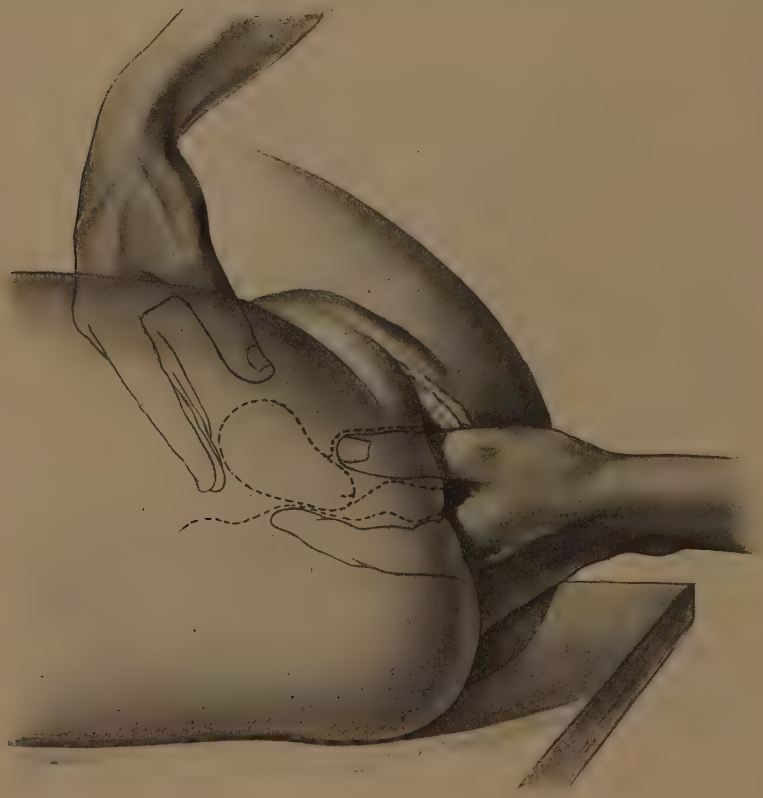

Fig. 10.—Rectovagino-abdominal Palpation. Index-finger of one hand in the rectum, thumb in the vagina, and the fingers of the other hand over the abdomen.

formation as to the condition of the pelvic organs. Such serious injuries have resulted from its practice, however, that it is now considered an unjustifiable procedure, unless the surgeon has an exceedingly small hand.

67. Precautions.—It would be unwise to dismiss the subject of bimanual examination without a word of caution. The pro-

cedure should always be exercised with care not to do injury. Anxiety to arrive at a correct diagnosis may lead to rupture of a tubal collection or an ectopic gestation sac, and to the necessity for prompt operation to save life. I have seen two patients in whom examination has been followed by rupture of ectopic gestation sacs, with death in both from internal hemorrhage.

68. Instrumental Examination.—The order generally recommended for the use of instruments has been: First, the use of the sound and then the speculum. The difficulty, however, in rendering the vagina sterile has justly led to the reverse procedure. The sound is a long, flexible instrument, twenty-five centimeters in length, two or three millimeters in diameter, terminating in a bulbous end, which generally has a slight elevation about six

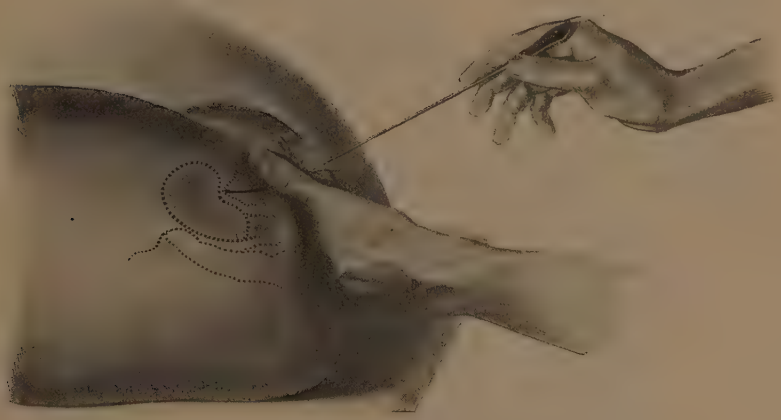

Fig. 11.—Rectovesical Palpation. Sound in Bladder.

centimeters from its end, which indicates the normal length of the uterine cavity. For convenience in measurement its posterior surface is marked by a scale in inches or centimeters. The instrument should be perfectly smooth, having no notches or indentations which may serve to retain infection. It is made of silver, or copper (silver or nickel plated), and should be sufficiently flexible to admit of its being readily bent. The handle should be roughened upon one side so that the concavity of the instrument can always be determined. Such an instrument is known as Simpson's sound. Sims advocated the use of a finer and more flexible instrument, known as the probe.

69. Probes may also be made of whalebone. The uses of the sound or probe are to ascertain the patency of the cervical canal,

the depth of the uterus, its width or capacity, the thickness of its walls, the presence of intra-uterine tumors, the condition of the mucous membrane, the direction of the uterine canal, and the

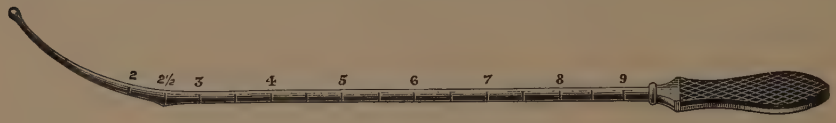

Fig. 12.—Simpson's Sound.

mobility of the uterus. In treatment it has been used to replace the displaced uterus. The experienced physician will be able to obtain much of this knowledge fully as effectually by the

Fig. 13.—Sims' Probe.

bimanual examination, and in the majority of cases the disadvantages of the instrument greatly outweigh the value of the information obtained by its use. It affords knowledge as to the patency of the canal which can not otherwise be determined; in

Fig. 14.—Whalebone Probe.

all other instances the omission of its use is preferable to its employment. It is true it is capable of affording information as to the direction of the uterus when the situation of that organ is rendered doubtful by the presence of inflammatory exudate,

Fig. 15.—Spring Probe Covered with Rubber.

but in such cases its use is contraindicated. Our inability to secure an aseptic vagina should lead to the introduction of the instrument through the speculum, and then only after the vault of the vagina has been carefully mopped with absorbent cotton

wet with a solution of bichlorid, 1 : 2000, or, better, of formalin, 1 : 1000. It is almost impossible to introduce the instrument without injuring the mucous membrane of the uterine cavity, an injury which will afford a favorable culture-field for the development of germs which are found in the vagina, or, exceptionally, even in the cervical canal. Such injuries explain the inflammatory irritation following its use, and still further demonstrate the wisdom of discontinuing its employment for replacement of the uterus. When it seems desirable to use the sound without

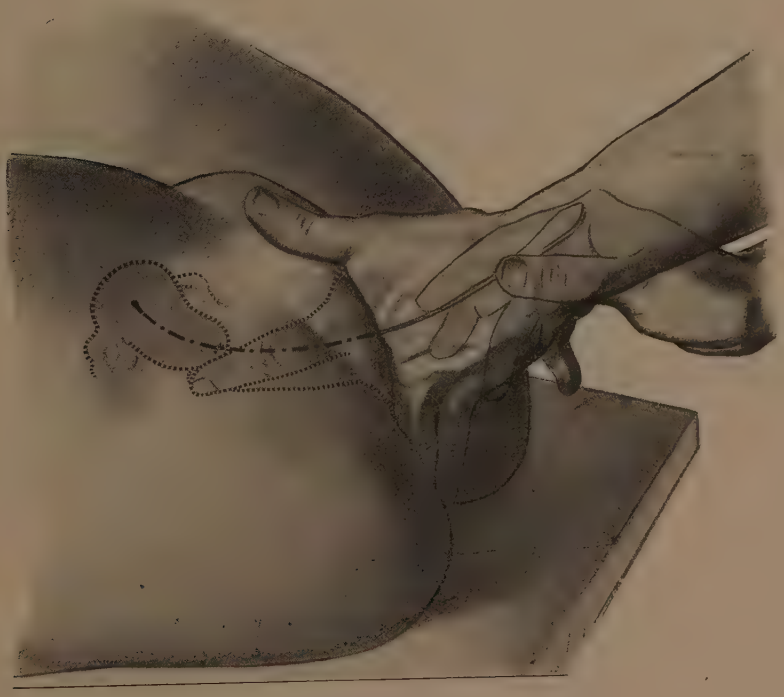

Fig. 16.—Introduction of the Sound.

the speculum, the vagina should be previously scrubbed and two fingers introduced to the cervix, by which the sound is guided into the os. (Fig. 16.) No force should be employed and the instrument should have such a curve as will permit it to pass readily in the direction which a bimanual examination has demonstrated should be that of the uterine cavity.

70. Precautions.—The date of the last menstruation must be known, and the use of the instrument should be avoided when there is the slightest suspicion of pregnancy. It should not be

employed in the presence of acute inflammation or when inflammatory exudate or old infiltrations can be determined. Its employment in a case of malignant disease may lead to dangerous hemorrhage. In the uterus softened and rendered friable by inflammation the sound may penetrate its wall and enter the abdominal cavity. This accident produces no inconvenience unless the instrument carries infection. The sound may also pass into a Fallopian tube. This is more likely to occur in a bicornate uterus. The instrument should be scrupulously clean and should be removed from a five per cent. solution of carbolic acid prior to its use. After its use in a case of suspicious character the instrument should be sterilized by heat.

71. Speculum.—A patient placed in the dorsal position, with the limbs separated, reveals the mons veneris, with the larger labia. The latter are separated by a cleft or slit—the rima pudendum. Frequently the labia minora are elongated, and they, with the clitoris, are prominent. The posterior commissure may have been injured, and, instead of a slit, we will have a triangular opening, through the posterior part of which projects the vaginal wall. In lacerations of the pelvic floor its posterior segment may be drawn back, permitting one or two inches of the vagina to be inspected. By hooking back the vagina with two fingers the cervix can frequently be seen. The necessity for satisfactory inspection of the uterus led to the invention of the speculum. A great variety of instruments for this purpose have been devised, but all may be classed in two divisions: the tubular and the valvular.

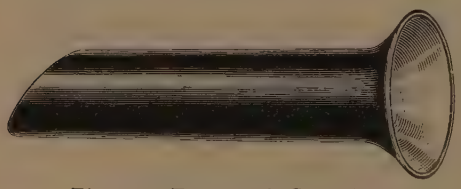

Fig. 17.—Ferguson's Speculum.

72. The tubular speculum, known as the Ferguson speculum, may be made of glass, wood, rubber, celluloid, or metal. The instrument is cylindric, the external end with a flange, the internal beveled, and having one long side. (Fig. 17.) Glass instruments may be made of milk-glass (Fig. 18), as the German speculum, or such covered with quicksilver, and over this a coating of pitch or rubber. Such specula can not be sterilized by heat; glass is brittle, easily broken, and is subsequently useless. They are very serviceable in making applications to the cervix, but only the wooden instruments are utilizable for the use of the actual cautery. The application of medicaments to the uterine canal, or the use through it of the sound, are to be condemned. The tubular speculum is not self-retainable. Its range of application is so limited that it is now infrequently

used. To introduce this instrument the physician separates the labia with the left hand and holds the speculum with the right thumb and middle finger on either side and the index-finger upon its upper surface. The longer side is placed against the posterior commissure of the vulva, which is depressed, and the speculum is pushed upward and backward, at the same time rotating the instrument so that its shorter side does not impinge against the tender anterior structures. The situation of the cervix has been previously located by the touch. If the cervix is not brought at once into the field of the speculum, it can usually be exposed by rotating the instrument. When this procedure fails, it may be drawn into the field by a tenaculum. If the cervix is large, only a part of it can be exposed at one time, and consequently a distorted idea of the condition is frequently obtained.

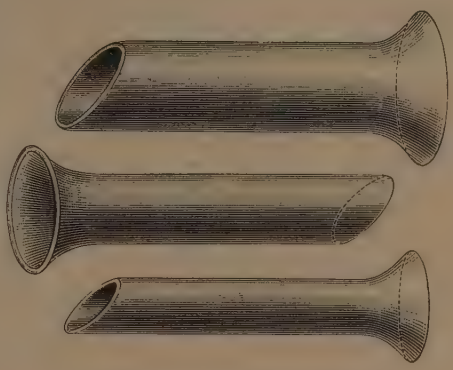

Fig. 18.—Milk-glass Specula.

73. Valvular Speculum.—The valvular speculum may have one or more valves, and are called univalve, bivalve, trivalve, and quadrivalve, according to the number of blades. They afford a much better exposure and are self-retaining; therefore, they have largely supplanted the tubular instrument. The quadrivalve instrument is now rarely used, as it affords but slight additional advantage over the bivalve, and besides it is difficult to keep clean. The Nott (Fig. 19) and Nelson specula have three blades and afford an opportunity to inspect the anterior vaginal wall. The bivalve speculum is the most satisfactory for general use. Of the great variety of specula, Higbee's (three sizes) (Fig. 20), Talley's (Fig. 21), and Goodell's (Fig. 22) are probably the most satisfactory. The

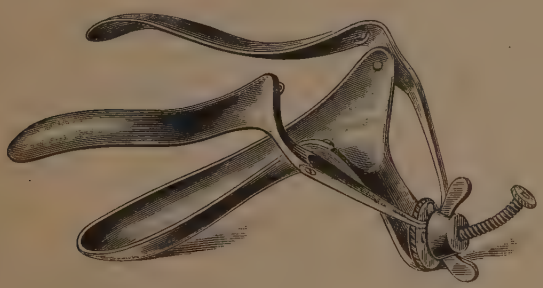

Fig. 19.—Nott's Speculum.

blade should be from 7.5 to 11 centimeters in length. When the vaginal portion of the cervix is short, the Higbee speculum,

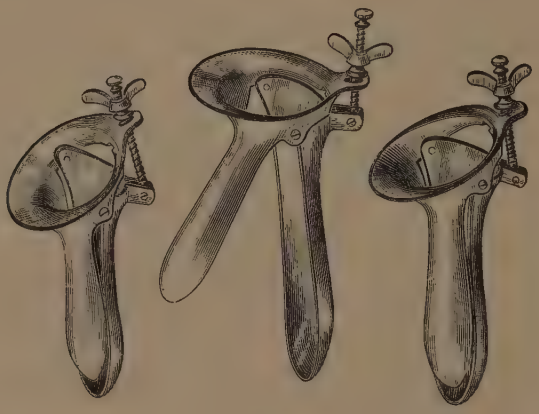

Fig. 20.—Higbee's Specula (three sizes).

which has a long posterior blade, will not expose the os. In such cases the Goodell or Talley specula, with blades of equal length, are better. The speculum is introduced by separating the vulva with the fingers of the left hand, while the instrument, held in the right, is introduced with its transverse diameter parallel to the long diameter of the vulva. As the widest diameter of the vagina is at right angles to that of the vulva, the instrument is rotated and carried upward, directing the blades behind the cervix, the position of which has been previously determined by a digital examination. As the blades are separated the cervix is generally exposed. In marked anteversion it may be necessary to use a tenaculum to bring the cervix into view. The speculum is a therapeutic instrument, although it confirms the diagnosis which has been made by digital examination.

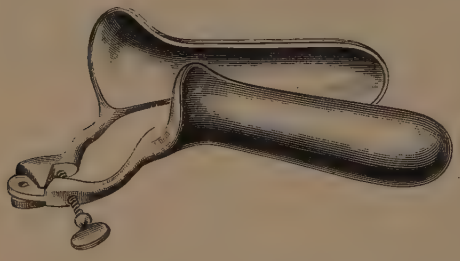

Fig. 21.—Talley's Speculum.

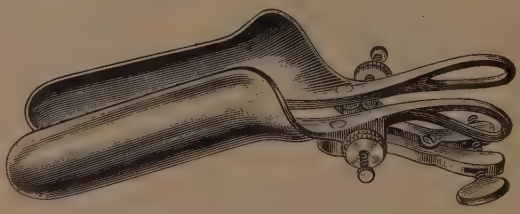

Fig. 22.—Goodell's Speculum.

74. The univalve or duck-bill speculum (Fig. 23), introduced by Sims, is used with the patient in the semiprone position. The instrument has two blades at either end of a handle, which are about 10 centimeters long, the smaller blade being 1.5 centimeters and the large blade 4 centimeters in width. To introduce this instrument the physician raises the buttock, passes the blade with its width parallel to the vulva, and after its entrance rotates it with the handle directed backward. The assistant then holds the other blade

Fig. 23.—Sims' Speculum.

Fig. 24.—Proper Method of Holding Sims' Speculum. The cervix brought into view with the tenaculum.

with the right hand, using the instrument as a retractor. (Fig. 24.) His elbow is held against his hip, while the left arm rests

upon the patient, the hand elevating the buttock. Care must be exercised to follow the curve of the sacrum or the instrument

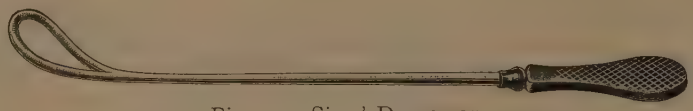

Fig. 25.—Sims' Depressor.

Fig. 26.—Goodell's Tenaculum.

will slip out. As the perineum is drawn back the vagina is ballooned by the atmospheric pressure and the cervix and upper vagina are exposed. When the vagina is large, with relaxed walls, the cervix may be obscured from view. The depressor (Fig. 25) to push back the anterior wall or a tenaculum (Fig. 26) hooked into the cervix will overcome the difficulty. The univalve speculum affords a better exposure of the cervix and upper portion of the vagina than any other form of instrument. Its particular disadvantage is that it is not self-retaining, and in office practice requires the assistance of a nurse.

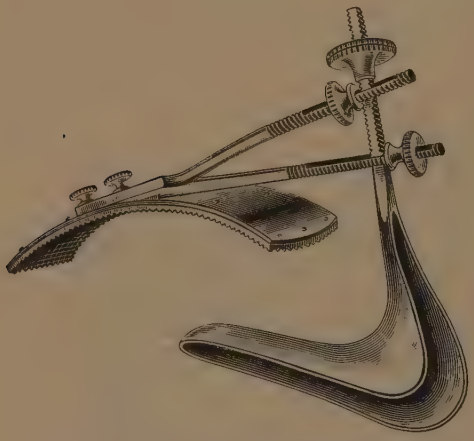

Fig. 27.—Self-retaining Sims Speculum.

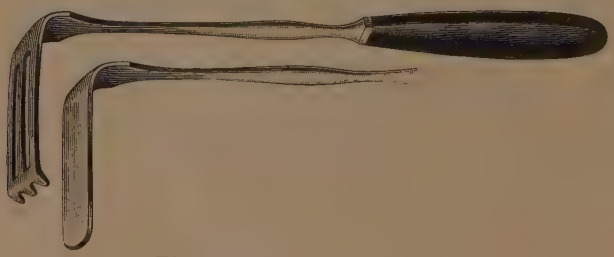

Fig. 28.—Simon's Retractors.

Various devices (Fig. 27) have been instituted to render it self-

retaining, but they require considerable time for their use. In operating with the patient in the semiprone position, the irrigating fluid and blood run forward, between the patient's limbs, and hence render it difficult to keep her person and clothing clean. The Sims speculum can be used with the patient in the lithotomy position, but it is uncomfortable to hold. The Simon posterior and side retractors serve a similar purpose. (Fig. 28.) The

Fig. 29.—Edebohls' Speculum.

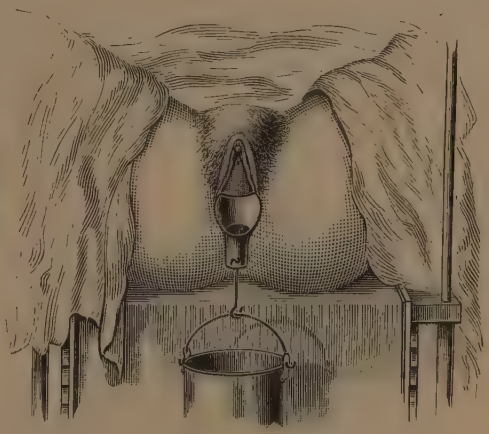

Fig. 30.—Edebohls' Speculum in Position.

perineal retractor known as the Edebohls speculum (Fig. 29) is the most satisfactory. With the patient upon her back, and the limbs acutely flexed, the perineum is retracted and held back by a weight attached to the instrument. (Fig. 30.) The cervix and the upper and anterior vagina are thus exposed to manipulation.

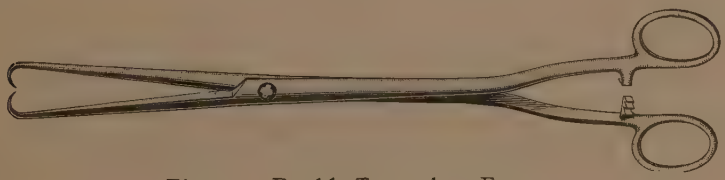

Fig. 31.—Double Tenaculum Forceps.

75. Uterine Fixation and Downward Traction.—Reference has already been made to the use of the tenaculum to bring the cervix into the field of the speculum. The same instrument, or, better, a double tenaculum known as bullet-forceps (Fig. 31), guided to the cervix by the finger, may be used to fix the organ, or in some cases to exert traction (Fig. 32) upon it during digital

examination. Such a procedure enables us to examine through the rectum the whole posterior surface of the uterus and even to pass the finger over its fundus. It is utilized in replacing the retroverted and retroflexed organ and in differential diagnosis of abdominal and pelvic growths.

76. Dilatation of the Uterus.—It is frequently necessary to explore the cavity of the uterus, either to complete the diagnosis of a condition rendered probable by other procedures or as a preliminary to an operation. The method of operation may be divided into two classes: (1) Bloodless—tents, divulsion, and gradual dilatation; (2) by incision of the external os and bilateral incision of the cervix. Before the practice of any of these procedures the presence of inflammation in the organ or vestiges of

Fig. 32.—Traction upon Uterus with Double Tenaculum during Digital Examination by the Rectum.

inflammatory exudate about it should be excluded. The existence of such conditions presents an element of serious danger.

77. Dilatation by Tents.—The use of tents was formerly very popular and a general method of dilatation. The materials used for this purpose were sponge, laminaria, tupelo, slippery elm, decalcified ivory, and gentian root. The sponge has the greatest dilating power, but is the most difficult to render aseptic and to maintain in that condition. The frequent unfortunate sequelæ that followed their use have largely led to their discontinuance. The laminaria (Fig. 33) and tupelo tents are the most used. The former may be introduced in nests. Their dilating power is enhanced by having them hollow. A number of small ones to fill up the canal is to be preferred to one large tent. They may be rendered aseptic by subjection to a dry heat of 250° F. The

tent should be placed in an envelope before its introduction into the sterilizer, and the envelope should be broken only when it is to be used. The tents may also be rendered safe by immersion prior to their use in a saturated solution of iodoform in ether. Pozzi advocates their immersion in equal parts of carbolic acid and alcohol. The vagina and cervix should be carefully cleansed

Fig. 33.—Hollow Laminaria Tent.

with an antiseptic solution; the cervix is seized through the speculum with bullet-forceps, while the tents are held in (Fig. 34) dressing forceps, and introduced, one after another, until the canal is filled. Care must be exercised to mold the tents to the curve of the canal, and no force should be employed in their introduction. The tents should project from the external os,

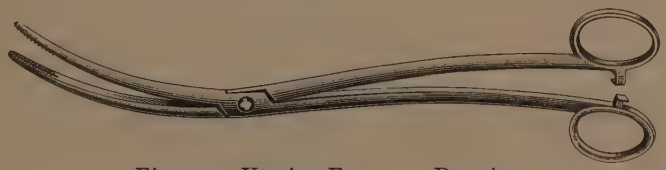

Fig. 34.—Uterine Forceps—Dressing.

and should be held in place by a tampon of iodoform gauze. They should be removed at the end of ten or twelve hours. They are removed by pulling upon a string fastened to the end of the tent. Removal is sometimes rendered difficult by irregular dilatation; the internal os, being more resistant, causes an hour-glass-shaped distention. (Fig. 35.) The tent is removed by

Fig. 35.—Dilated Tent Showing Constriction from Internal Os.

placing the finger against the cervix during traction. The irregular dilatation is less likely to occur with a tupelo tent, though its dilating power is not so great. Pain during the dilatation can be relieved by the use of from two to five grains of acetanilid or from $\frac{1}{4}$ to $\frac{1}{2}$ of a grain of codein. The removal of the tent

should be followed by careful antiseptic irrigation, after which another tent or series of tents may be introduced. The use of the tent affords an opportunity to make a digital exploration of the uterine cavity, and is of advantage in small submucous

Fig. 36.—Ellinger's Dilator.

Fig. 37.—Goodell's Modification of Ellinger's Dilator.

fibroids, in suspected epithelioma, and in retained products after abortion.

78. Divulsion consists in the rapid dilatation of the uterine canal by the various dilating instruments. The preferable instruments are the parallel bar dilators, such as the Ellinger (Fig. 36), with the Baer and Goodell modifications (Fig. 37); the latter, with its roughened blades, is a powerful instrument. The vagina and cervical canal are carefully cleansed, and through the speculum the cervix is seized with a double tenaculum and stretched with small dilators, and subsequently with the large instrument to the extent of two or three centimeters, if desired. The principal objection to the procedure is that the pressure is confined to the lateral surfaces of the cervix and, therefore, may lead to laceration.

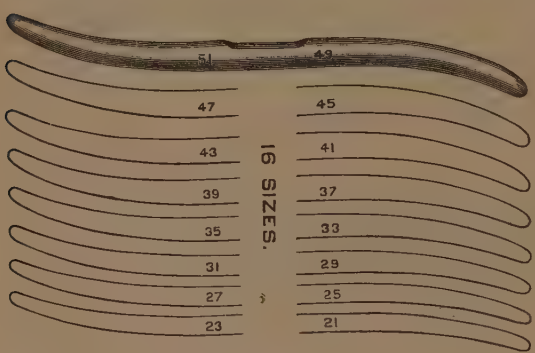

Fig. 38.—Pratt's Dilators.

79. Gradual dilatation is accomplished by the use of graduated

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bougies, made of steel or hard rubber. The former are preferable, as they can be sterilized by heat. The Pratt series of bougies, which have two bougies to each handle, making eighteen in the set, the maximum being No. 43, will be useful. (Fig. 38.) Each bougie is two millimeters larger than the preceding. After thorough cleansing of the vagina and cervix the Edebohls speculum is introduced, the cervix is seized with vulsellum or double tenaculum, and the bougies are used one after another, up to the largest size. (Fig. 39.) Care should be exercised not to puncture the uterine wall. This accident is more likely to occur in acute flexions; the point of the instrument makes so much pres-

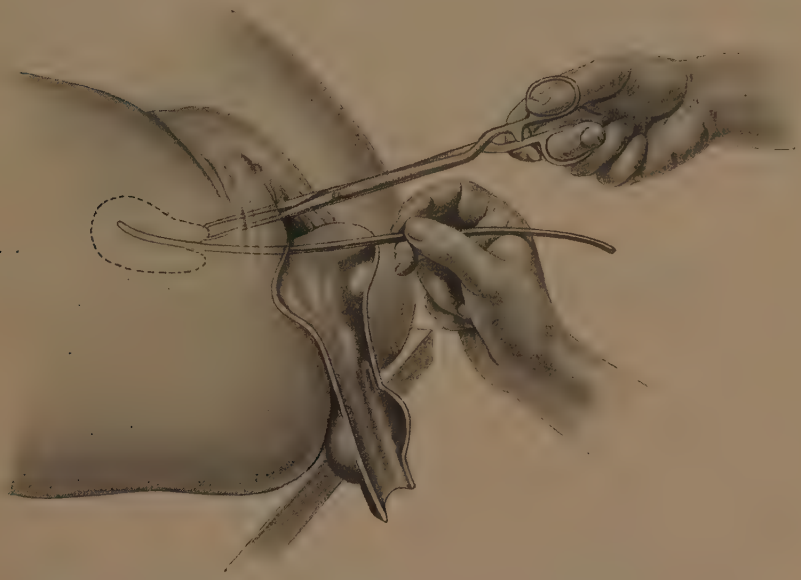


Fig. 39.—The Method of Dilatation with the Graduated Bougies.

sure upon the thin convex wall near the flexion that it finally ruptures. It is sometimes advised to precede this method by the use of a tent, but it does not seem necessary. The dilatation can be accomplished by the bougies in shorter time than by divulsion.

80. Incision of the Cervix.—The external os, when very rigid, or when the cervical canal is partly dilated by an extruding fibroid, may be incised. This procedure may be resorted to for abortion in the absence of proper dilating instruments. An incision from 1 centimeter to 1.5 centimeters should be made with scissors upon either side. As the ordinary scissors slip off,

the Kuchenmeister scissors (Fig. 40) are more effective. The procedure is most readily accomplished by grasping each lip with a double tenaculum and incising on either side with a knife. The operation completed, the incised cervix should be closed with sutures.

81. Complete bilateral incision of the cervix is rarely indicated, as other measures of less severity can be utilized. The operation may be supplemented, if necessary, by ligation of the uterine arteries. The vessels may be secured by drawing the cervix to one side and passing a ligature with a strongly curved needle. Care should be exercised to keep close to the uterus and not to carry the ligature forward of a line tangent to the anterior circumference of the cervix, in order to avoid ligation of the ureter. A second ligature is passed upon the opposite side, when the cervix can be incised with a knife to the vaginal fornix on either side without danger of hemorrhage. Although generally advised that ligation should precede incision, it is unnecessary. Hemorrhage does not always occur, and when it does, the bleeding

Fig. 40.—Kuchenmeister's Scissors.

vessels can be seized with forceps and then ligated. If the finger can not be passed through the internal os, the canal can be still further enlarged with a probe-pointed bistoury. After exploration or operative procedure the cervix should be carefully sutured. The lateral ligatures should be removed in two or three hours, or in a shorter time if there is any reason to fear that the ureter has been ligated. The prolonged retention of the ligatures would result in sloughing of the vagina.

82. Dilatation by Gauze Packing.—Vulliet has devised a procedure for prolonged dilatation, which he denominates a "method of dilatation by progressive plugging." It consists in repeated plugging of the cervical canal with medicated gauze. Strips of gauze, after the uterus has been carefully cleansed, are packed into the cervical canal until it is completely filled. These are permitted to remain for forty-eight hours, when they are removed, and if the uterus is not then dilated sufficiently to admit the finger, the cavity is again cleansed and packed. Pieces of

compressed sponge have been used for a similar purpose, and, from their increase in size under moisture, are probably more effective. The only source of anxiety is the uncertainty as to their being absolutely sterile. This plan of procedure may be carried over a series of days or weeks, without inflammatory reaction. It is, however, not effective in cases of rigid cervix, and the same purposes may be accomplished by a more rapid dilatation.

83. Cureting.—The curet in doubtful cases may afford sufficient material for a microscopic examination to make the diagnosis certain. (Fig. 41.)

84. Microscopic Examination.—The most careful examination by touch and sight will often fail to reveal minute tissue changes, which are of such ultimate importance as to render their prompt discovery vital to the interests of the affected individual. The microscope in such conditions is a valuable diagnostic agent. To its use we are indebted for our knowledge of the normal structures of the genital tract. It has revealed the character and variety of the epithelium, its situation and relation to the glandular

Fig. 41.—Douche Curet.

structure—information which could not be otherwise procured. It is, therefore, reasonable to consider that it would be equally valuable in demonstrating pathologic alterations in the course and progress of disease as impressed upon the tissues, and consequently prove a valuable means of diagnosis, upon which can be based definite ideas of prognosis and suitable methods of treatment.

85. Microscope.—Microscopic examination confirms the suspicion of a disease awakened by subjective symptoms, and the microscopic appearance of tissue reveals the extent, stage, and progress of the disease, and also demonstrates any error occasioned by misleading symptoms or unusual signs. The microscope, associated with bacteriologic cultures, is effective in confirming the diagnosis of gonorrhea, tuberculosis, sepsis, typhoid fever, and between benign and malignant neoplasms. It affords a certain means of differentiation between malaria and obscure forms of sepsis. The microscopic study of the blood is of special value in the recognition of various forms of anemia, and affords information which is useful in determining the prognosis. A

differential blood count is frequently confirmatory of a given diagnosis of inflammatory, suppurative, or malignant disorders, and it is, therefore, especially valuable in making accurate diagnoses. The more accurate the diagnosis, the more certain the prognosis, and, therefore, the more hopeful the method of treatment. When we consider the rapid changes that take place in malignant disease, the extension along the course of lymph channels to the lymph glands, subsequently involving the tissues which are inaccessible, we can appreciate the importance of any method which will afford early knowledge of the serious character of the disease. The method of determining the diagnosis by watching the course of the disease can not be too strongly condemned. Not infrequently such assured recognition of the disease is associated with the knowledge that the time for successful operative treatment has elapsed.

86. Material.—The material upon the investigation of which the diagnosis is based is procured by test excision or test cureting of the parts accessible. The tissues excised should not be confined to the diseased structure, but should comprise an area which will show the transition from healthy to diseased tissue. When the disease is within the uterine cavity, the tissue can be secured by the curet. The cureting is more effectively done after dilatation of the uterus either by graduated bougies or, preferably, by tents. If the latter are employed, the finger can be introduced and act as a guide to the curet. Occasionally portions may be broken off by the finger or masses may spontaneously discharge.

87. Methods.—A dangerous operation, the future comfort of the patient, and, indeed, her chances for life will often depend upon an examination of the specimens secured. It is, therefore, necessary to employ all the finer methods of microscopic technic at our disposal. The excised tissue as well as the particles secured by cureting should be washed in running water and carefully inspected with the naked eye, and also with a magnifying glass; by which its color, consistence, and general structure can be recognized. During this examination it can be determined what course shall be pursued in fixing and preparing for a more complete examination. As the tissue will undergo marked change in this process of fixing, it is wise that a drawing should be made and the direction in which the future sections are to be cut determined. Abel advises that excised portions be divided so that one part can be examined while fresh, and the other be prepared for finer sections. Cureted material, unless in large quantities, should be at once placed in a fixing solution.

The fresh specimens are at once placed in normal salt solution which preserves the individual elements in their original form. The particles may be examined as teased specimens, or be cut with

the freezing microtome. The latter course is preferable, as it interferes less with the relations of the structures, and, consequently, permits a more correct judgment as to the condition.

By teasing the elements are separated from each other when it is impossible to decide whether the surface epithelium sends processes into the tissues or whether a simple hyperplastic or destructive process exists—points of the greatest importance in arriving at a correct diagnosis.

The fresh specimen should be cut with the freezing microtome, but the sections should not be too thin, as they are likely to tear in subsequent manipulation.

Each section is removed from the knife with a camel's-hair brush and placed in distilled water. To prevent the sections from being torn in transmission to the slide, it is better that the latter be pushed under the section as it swims in the fluid and be gently held with a glass rod.

The section, having been carefully spread upon the slide, is then covered with a fine cover-glass. The latter is grasped at one edge with forceps, the other side brought at an acute angle upon the fluid covering the surface of the slide and gently released, removing the superfluous fluid with blotting-paper. The section can now be studied with high or low power, but when unstained is best placed upon a dark under layer.

Specimens so studied have the advantage that we see the cells as they were during life, and the character of the normal tissue or any degenerative process can thus be recognized.

The specimen may be subjected to various microchemical reactions which will afford valuable information. The section may be rendered more transparent by a drop of a 2 or 3 per cent. solution of acetic acid placed under the edge of the cover-glass. A piece of blotting-paper held at the other side causes it to penetrate the section quickly. Fatty tissues may be removed by the similar use of alcohol, chloroform, or ether.

Elastic fibers are rendered prominent by caustic soda in a 1 to 3 per cent. solution. A marked swelling of the contractile elements of the smooth and striated muscles and of the nuclei occurs, and the horny substance becomes transparent. A 33 per cent. solution of caustic potash is especially valuable as a preservative. Red blood-cells preserve their form well in such a solution.

Infarctions or plethora of blood-vessels are in no way so well observed as in fresh specimens. They may be permanently preserved by replacing the salt solution with glycerin, or preferably with a 55 per cent. solution of potassium acetate. Pick's method presents the best procedure for preserving frozen specimens, and consists in the use of alum-carmin combined with formalin.

The alum-carmin of Grenach (4 to 5 per cent. of carmin) is added to Schering's formalin 10 to 100, which should be kept in a dark-colored bottle.

Pick's process is as follows:

1. Preparation of the frozen section with Jung's microtome.
2. Transference of the section into a 4 per cent. formalin solution for one-fourth minute.
3. Formalin-alum-carmin, two to three minutes.
4. Washing in water, one-half minute.
5. Eighty per cent. alcohol, one-half minute.
6. Absolute alcohol, ten seconds.
7. Carbol-xylol, one-half minute.
8. Canada balsam.

Coplin says that his experience convinces him of the necessity for thoroughly fixing all tissues before attempting to section them, otherwise the results are always open to criticism, because the distortion incident to congelation masses; maceration; and the difficulty of removing the infiltrates produce conditions which would mislead the most experienced observer. He advises the following fluids:

1. Flemming's solution, which consists of a 1 per cent. aqueous solution of chromic acid, 25 volumes; 1 per cent. aqueous solution of osmic acid. 10 volumes; 1 per cent. aqueous solution of acetic acid, 10 volumes; water, 55 volumes.

All water in stock solutions and final mixtures must be distilled. Small pieces (five-tenths—1 cm. cube) will undergo sufficient fixation in from one-half to two hours. After this process is complete they should be washed in running water for six hours.

2. Hermann's solution: 1 per cent. aqueous solution of platinic chlorid, 15 volumes; 2 per cent. aqueous solution of osmic acid, 2 volumes; glacial acetic acid, 1 volume.

3. He regards corrosive sublimate solution as the most useful fixing agent for general use, although for pure cell study the first two solutions are probably better. It consists of 125 gm. of corrosive sublimate dissolved in a liter of 0.5 per cent. solution of sodium chlorid in water. Small pieces fix in this solution in from one-half to two hours. The used solution is filtered back into the stock solution, while the hardened tissue is washed in water, or preferably in 70 per cent. alcohol. This solution is of advantage because of its cheapness, keeping qualities, and simplicity of technic.

In the process of fixing with any of the plans, the quantity of fluid should several times exceed the volume of tissue to be fixed.

It is important for purposes of diagnosis that the tissues

should not only be properly fixed, but that sections should be made with as little disturbance of cell relation as possible. Attention must also be given as to the direction in which sections shall be made through the tissues. Sections parallel with the surface of a mucous membrane are of but little value, as they cut across glands and afford no indication of the true character of epithelium. The most serviceable are the vertical or slightly oblique.

Embedding.—A small piece of tissue may be prepared for section-cutting by being embedded in either gelatin, celloidin, or paraffin.

Glycerin-gelatin.—Ten grams of the finest gelatin are placed in a clean vessel and covered with water. After four to six hours the water is poured off, and the mass liquefied by a moderate heat. While stirring with a glass rod, ten grams of glycerin and five drops of carbolic acid are added, and the mixture left in a wide-mouthed bottle. To embed a specimen, a piece of this mass is taken and liquefied by heat. A thin layer is poured upon the surface of a cork, the specimen placed upon it, and then covered with a mantle of gelatin which soon becomes hard.

After being mmersed in absolute alcohol for twenty-four hours good sections can be made.

Celloidin.—The specimen is placed for twenty-four hours in absolute alcohol, and the same length of time in sulphuric ether. It then remains twenty-four hours in a tight bottle containing thin celloidin. At the end of this period it is placed in a thick solution, a small opening being left so that the alcohol and ether evaporate very slowly. In a few hours a semi-solid mass has formed, a block of which containing the specimen is cut out, fastened with thick celloidin upon cork or wood, after which it remains for twelve hours in a 70 to 80 per cent. solution of alcohol, when it has the proper consistence for section-cutting.

Paraffin.—Abel prefers to stain the specimen preparatory to embedding in paraffin. The specimen, hardened in alcohol, is placed in the staining solution. This may be Bohmer's hematoxylin, eosin, or safranin. It should remain in a well-filtered solution two to eight days, according to its thickness. It is removed from the staining solution to 70 per cent. alcohol for twenty-four hours, then is dehydrated in absolute alcohol. It is placed in xylol for twelve hours to prepare it for saturation with paraffin. The specimen is placed in a mixture of equal parts of xylol and paraffin, in which it remains for twenty-four hours, subjected to a continuous temperature of 37° C. in a paraffin oven, after which it is kept in paraffin at a temperature of 48° to 50° C. The latter is then permitted to solidify at the room-temperature, when a paraffin block of suitable size containing the

specimen is cut out and fastened to a cork or a piece of wood with paraffin, after which it is ready for cutting.

The sections thus secured are thinner than those secured by any other method.

Section-cutting.—Sections are preferably cut with a microtome and should be of equal thickness. A thickness of fifteen to twenty microns will be satisfactory.

The sections are conveyed with a camel's-hair brush to a basin containing dilute or absolute alcohol; the celloidin sections to a 70 per cent. solution of alcohol, the gelatin sections to absolute alcohol. The sections are very much shriveled by the alcohol and should be placed in water for several minutes before being transferred to the staining fluid.

The paraffin sections can not be transferred from one vessel to another; it is better to treat them on the slide. Abel applies one drop of a solution of collodion in alcohol upon a slide, and upon this the section, pressing it down with filter-paper. The paraffin is dissolved out with xylol, and covered with equal parts of xylol and Canada balsam, and over this the cover-glass is carefully placed.

Staining.—We will consider only those methods which are most effective in rendering prominent the histologic structures we are desirous of utilizing in the diagnosis. Picrolithiocarmin and hematoxylin are both very satisfactory.

The *picrolithiocarmin*, introduced by Orth, is prepared by uniting one part of lithiocarmin (a cold saturated solution of lithium carbonate in which carmin powder has been dissolved in the proportion of 2.5 grams of the latter to 100 grams of the former solution) with two parts of a saturated solution of picric acid. This stain is best suitable for specimens which have been hardened with alcohol. The section is placed in the staining solution by a spatula and remains five to ten minutes, from which it is conveyed for one to two minutes to a solution of alcohol (70 per cent.) one hundred parts, hydrochloric acid one part, then washed in dilute alcohol and dehydrated in absolute alcohol. The specimen is made clearer by oil of cloves, oil of bergamot, or xylol. It is conveyed to the slide and spread out free of folds. It is then mounted in Canada balsam. Horny cells, fibrin, hyaline substances, and red blood-corpuscles take on a yellow color. The nuclei of the epithelium become a pale pink, fibrillar tissue remains undyed, affording a clear picture of the specimen stained.

Hematoxylin stain is prepared by dissolving one gram of hematoxylin in 30 grams of absolute alcohol. To a solution of powdered alum (0.5 to 1 gram in distilled water 30 cm.) the above preparation is added drop by drop and shaken until the fluid

takes a deep violet color. It is left for several days in a wide-necked bottle uncovered, when it becomes darker. It should be carefully filtered before being used.

Celloidin-embedded sections remain longer (ten to twenty minutes, according to size and thickness) in the solution than the ordinary alcoholic sections, and are placed in alcohol containing hydrochloric acid until they begin to assume a red tint, from which they are removed to 70 per cent. alcohol. They are placed in absolute alcohol until the mantle of celloidin begins to curl. Care must be exercised that all the celloidin is not dissolved or the finer sections would fall to pieces. The section is made transparent in oil of bergamot or in xylol. Should the celloidin mantle at this stage become cloudy or milky, the section should be placed in absolute alcohol until it clears. With a spatula the section is placed upon a slide and mounted in xylol-Canada balsam after removing the oil with filter-paper. This method gives splendid staining of the nuclei, the protoplasm is slightly stained, the celloidin not at all. The diagnosis of malignant conditions is greatly enhanced by staining the elastic fibers. For this purpose Taenzer's orcein stain is employed. The sections are taken from water and kept in this solution from six to twelve hours or longer (Grübler's orcein 0.5, alcohol 40.0, aq. dest. 20.0, hydrochloric acid gtt. xx), then placed for a few seconds in hydrochloric acid alcohol (hydrochloric acid 0.1, 95 per cent. alcohol 20.0, aq. dest. 5.0), where they become differentiated and are washed in water. After five to ten minutes' dehydration in absolute alcohol, they are cleared in oil and mounted in Canada balsam.

The elastic fibers appear as an intense red upon a pale pink background.

Weigert's fuchsin-resorcin stain is made by taking 200 c.c. of the following mixture: Resorcin 2.0, fuchsin 1.0, distilled water 100.0, and bringing it to a boil in a porcelain vessel, when 25 c.c. ferri liq. sesquichlor. (German Pharmacopeia) are added, the whole boiled while stirring for two to five minutes longer. The muddy mass thus formed is permitted to cool and then filtered. The portion which runs through the filter is thrown away, and the deposit left upon the filter until it ceases to drip.

The filter with its contents is removed from the funnel, placed in a bowl, and boiled under constant stirring with 200 c.c. of 94 per cent. alcohol. While boiling the filter-paper is removed and the solution is permitted to cool, after which it is filtered and the filtrate brought to 200 c.c. by the addition of alcohol. After adding 4 c.c. of hydrochloric acid the solution is ready for use.

The sections are placed in this solution for twenty minutes to one hour, washed in alcohol, and cleared in xylol.

The elastic fibers are stained dark blue, almost black, on a

quite light background. The nuclei may be stained with a carmin preparation.

88. Failure.—Examination may fail to reveal the true character or presence of disease, because the section was made through the adjoining healthy tissue.

89. Bacteriologic Cultures.—Any discussion of the usefulness of the microscope as an agent in the diagnosis of disease would be defective which did not recognize the influence of micro-organisms in the development of diseased processes and consider the best methods of securing their ready recognition. We are coming more and more to recognize that to intelligently battle with the results of disease, we can not be too well informed as to its cause. The position of micro-organisms as an important factor in the production and propagation of disease is now too universally acknowledged to admit of further question. The more important micro-organisms against which our energies must be directed are the gonococcus, the staphylococcus pyogenes aureus, staphylococcus albus, the streptococcus pyogenes, the bacillus coli communis, and the bacillus tuberculosis.

90. The gonococcus of Neisser, found in gonorrheal discharge, is difficult to cultivate outside of the body. It exists in the form of a diplococcus, penetrates the protoplasm of pus cells, and rapidly multiplies therein. (Fig. 42.) The cocci develop in cellular epithelium, such as is found in the male and female urethra, Bartholin's glands, the uterine cavity and the conjunctiva. The baneful influence of this micro-organism has been regarded as the cause of nearly all the inflammations of the tubes and ovaries. The gonococci may be sought in the secretions or in sections of the tissues. From the former, glass slide or cover-glass specimens of the secretion are made by spreading it and letting it dry. The specimens are first dried in the air and subsequently carefully drawn through the flame several times, after which they are ready for staining. Abel recommends that after covering the dry specimen with a watery concentrated methylene-blue solution (Unna) it shall be heated until it steams, washed in water, dried with filter-paper and mounted in Canada balsam. By this process the gonococci as well as the other cocci are stained a deep blue.

The gonococci are easily recognized as they lie in pairs next to each other (biscuit-shaped), and are mostly found in small groups both within and without the protoplasm of pus cells. When they are found outside these cells, they might readily be mistaken for other cocci if we had no method of differentiation. This is found in the decolorizing procedure of Gram, by the use of Lugol's solution. The gonococci are decolorized, while the other

cocci retain the stain. By Gram's method the gonococci may be differently stained. The dry slide specimen, after being stained with picrocarmin or thin fuchsin solution, is washed in water and dried, then stained for one-half minute with Ehrlich's anilin-water gentian-violet solution, washed one minute with Lugol's solution

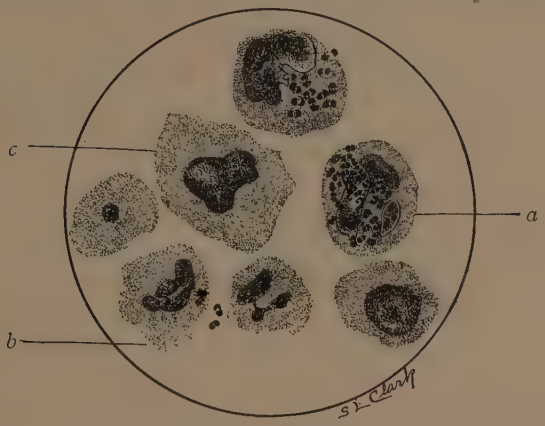


Fig. 42 *a*.—Secretion from gonorrheal vaginitis, showing the gonococci both within and without the pus cells.

a, Pus cell containing gonococci; *b*, pus cell undergoing dissolution; *c*, large epithelial cell.

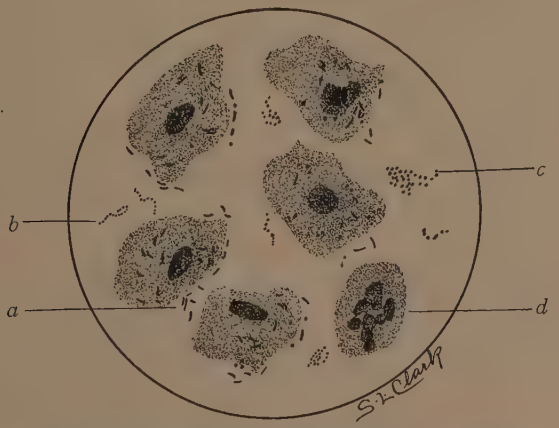


Fig. 42 *b*.—Secretion of simple vaginitis, showing various forms of organisms found and preponderance of epithelial cells.

a, bacilli; *b*, streptococci; *c*, staphylococci; *d*, pus cell.

(iodin 1, potassium iodid 2, water 300), and moved in alcohol until maximum decolorization is secured. After being washed in running water, dried, and mounted in xylol-Canada balsam, the gonococci are found to be stained red, while the other cocci are blue.

The gonococci are found in sections with much more difficulty than in the dried specimens. Wertheim's method consists in soaking the sections for three to five minutes in anilin-water gentian-violet, in Lugol's solution one minute, in 95 per cent. alcohol for decolorizing,—but this should not be complete, as the section must retain a distinctly violet color,—in water methyl-blue solution for a few minutes, in absolute alcohol one-half to one minute, in oil of bergamot and finally mounted in Canada balsam. The most difficult part is to determine the time the section should be left in the alcohol: if for too short a time, the gonococci are not seen upon the too dark background; if the time is too long, they are decolorized.

As to desirable culture-media for cultivating gonococci, Coplin advises urine-agar. The urine is neutralized or rendered faintly alkaline. One per cent. of peptone and five-tenths of sodium chlorid added. After filtration, preliminary boiling, filtration while hot, and again when cold, the agar is added and dissolved as in the preparation of beef-peptone agar. In forty-eight to seventy-two hours after inoculation, large colonies of gonococci will develop in such a fluid.

91. Staphylococcus pyogenes aureus is the most important micro-organism, because the most frequent. (Fig. 43.) It is

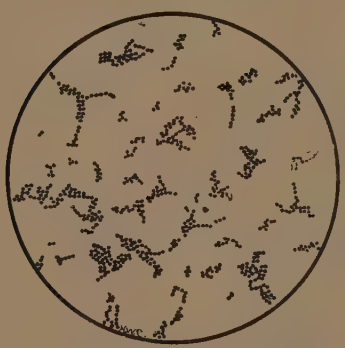


Fig. 43.—Staphylococcus Pyogenes Aureus. From Pure Culture in Bouillon. (Zeiss, 2 mm., Oc. *c*.)

Fig. 44.—Streptococcus Pyogenes. From Culture in Bouillon. (Zeiss, 2 mm. Obj., Oc. *c*.)

found upon almost all the cutaneous and mucous surfaces of the body, in water and in the air, especially that of hospital wards. The organisms differ greatly in virulency, and outside of the body have great tenacity of life. It is a spherical coccus, which grows readily in clusters or grape-like masses upon all the ordinary media, promptly liquefies gelatin and falls to the bottom, presenting a bright orange color. It stains readily with the anilin dyes. The other organisms of this growth are less virulent.

92. Streptococcus pyogenes grows in the form of chains, which may be of considerable length. (Fig. 44.) It grows more slowly than the staphylococcus and is much less resistant outside the body and dies out in culture more readily. As a form of infection it is more virulent than the staphylococcus. It is the most frequent cause of puerperal fever and puerperal peritonitis. It is frequently found in pyemia. It can cause inflammation, local suppuration in any portion of the genital tract, and may invade the lymphatics and blood-vessels and cause peritonitis or septicemia.

93. The bacillus coli communis is an organism which grows in short, thick rods with rounded ends, and occasionally forms long threads. (Fig. 45.) It forms no spores. It is the chief organism of the large intestine under normal conditions. It is a frequent cause of suppurative peritonitis, and is found in suppurative conditions associated with intestinal inflammation and suppura-

Fig. 45.—Bacillus Coli Communis. From Pure Culture in Bouillon. (Zeiss, 2 mm. Obj.. Oc. *c*.)

Fig. 46.—Bacillus Tuberculosis. (Zeiss, 2 mm., Oc. *c*.)

tion. It is frequently present in inflammation of the urinary tract, such as cystitis, pyelitis, and renal abscess. Cultivations are frequently more virulent. These organisms may be responsible for inflammation or even suppuration of an ovarian cyst following twisting of the pedicle.

94. The bacillus tuberculosis occurs as minute rods which measure 2.5 μ to 3.5 μ in length and 0.3 μ in thickness. (Fig. 46.) They are slightly curved, fairly uniform in thickness, but slightly swollen at the ends. They retain their vitality for a considerable period outside the body, also resist drying and putrefaction, but readily succumb when exposed to direct sunlight. All the genital structures are susceptible to the tubercular infection, but it occurs most frequently in the Fallopian tubes. When found, careful

examination should be made to exclude its presence in other portions of the body. Tubercular peritonitis may occur at any age, but is most frequent between twenty and thirty years. The urinary tract is not infrequently involved. When the bladder is the seat, it produces a very distressing cystitis. It may be primary or secondary; when the latter, it may have descended from the kidney. The writer has recently seen a girl, fifteen years of age, whose parents died of pulmonary tuberculosis, in whom the entire bladder mucosa was involved. Both ureters were distinctly palpable through the vagina and could be outlined as thickened, indurated cords.

The tubercle bacillus, like the gonococcus, may be studied in the secretions or in sections of the infected tissues.

The staining is best managed by Gabbett's quick-staining method, in which the dry specimen is stained ten minutes in carbol-fuchsin (fuchsin, 1.0; alcohol, 10.0; acid. carbolic., 5.0; aq. dest., 100.0), washed in water, dried with filter-paper, placed for five minutes in sulphuric-acid-methyl-blue solution (methyl-blue, 2.0; acid. sulph., 25.0; aq. dest., 100.0), again washed in water and dried with filter-paper. If red areas still remain, the specimen must be replaced for several minutes in the sulphuric-acid-methyl-blue solution. After drying, the specimen should have a light blue appearance; then it should be mounted in Canada balsam. The tubercle bacilli are stained red, while everything else is stained blue. Sections for staining are placed in either warm or cold carbol-fuchsin solution for twenty-four hours. After treatment with sulphuric-acid-methyl-blue solution, the section is dehydrated in alcohol, cleared in xylol, and mounted in Canada balsam.

95. Exploration of the Urethra, Bladder, and Ureters.—A digital exploration of the bladder is rarely required. Frequent and painful micturition may require a urethral or vesical investigation. Inflammation of the urethra may be recognized by tenderness and thickening of the canal as revealed by touch of the anterior vaginal wall. The urethra can be felt as a cord-like projection beneath the pubes. The condition of the urethral mucous membrane can be determined by the use of Skene's urethral endoscope. (Fig. 47.) Points of inflammatory redness, desquamated epithelium, fissures, and thickened membrane are thus recognized. It is important that the instrument should not be very large, otherwise the pressure obscures the pathologic

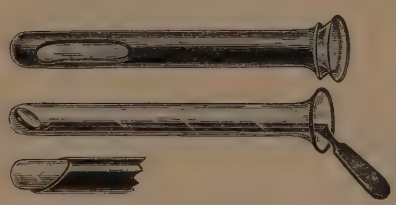


Fig. 47.—Skene's Urethroscope.

alterations. Dilatation of the urethra by bougies will permit the exploration of the bladder by the introduction of a test-tube and the use of a small mirror passed into the tube at such an angle as to afford a view of a large part of the surface. The urethral specula devised by Kelly (Fig. 48) afford an opportunity to evacuate the bladder and give a view of its entire internal surface. The urethra is dilated by bougies to an extent sufficient to admit the speculum desired, which is introduced upon an obturator. With a good light the condition of the mucous membrane can be recognized and suitable medication applied. The best exposure of the surfaces of the bladder is obtained through the electric cystoscope. It is so arranged that the mucous membrane can be examined with the bladder either collapsed or in a state of dis-

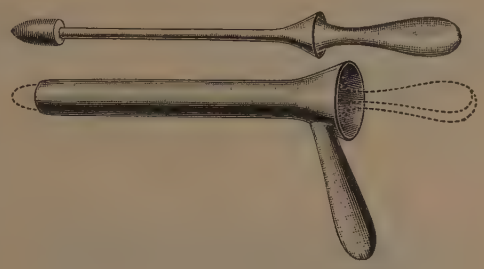


Fig. 48.—Kelly's Specula (Urethra).

Figs. 49 and 50.—Ureteral Catheters. Metal and Soft.

tention. With it the orifices of the ureters can be exposed and catheterized, thus facilitating the determination of the relative condition of the two kidneys. The catheter can be passed without the speculum or cystoscope, but the danger of introducing infectious material from the urethra or bladder is too great to

Fig. 51.—Mouse-tooth Forceps for Cotton Pledgets.

render it an advisable procedure. A long ureteral catheter of soft material can be introduced to the pelvis of the kidney. It affords certain knowledge of the condition of the organs as determined by their secretion. This knowledge may be of infinite

value when we determine that one kidney has been destroyed. Its use also discloses the existence of stricture or obliteration of the ureter. A flexible bougie with wax tip has been employed by Kelly and others in the diagnosis of a calculus in the pelvis of the kidney or in the course of the ureter.

Fig. 52.—Kelly's Evacuator.

Harris's seggregator or separator is an apparatus which consists of a double catheter, the ends of which are separated after being inserted into the bladder by pushing the vesicovaginal septum between them from the vagina with a blunt staff introduced into the latter canal. Sulci are thus formed in which the urine of each kidney accumulates separately and is drawn off into separate receptacles. This apparatus permits the secretion of each kidney to be studied at a less expenditure of skill than is required for catheterization of the ureters.

Palpation of the ureter, by which thickening and inflammation of the canal can be determined, is practised by passing the finger behind the uterus in the vagina, and then drawing it forward upon either side of the cervix (Sänger). The ureter will slip over the finger, giving the sensation of a good-sized cord. In inflammation, the ureter will be thickened, and the patient will complain of pain. In a case under my observation blood and urine were ejected with force from the urethra when pressure was made over the right ureter.

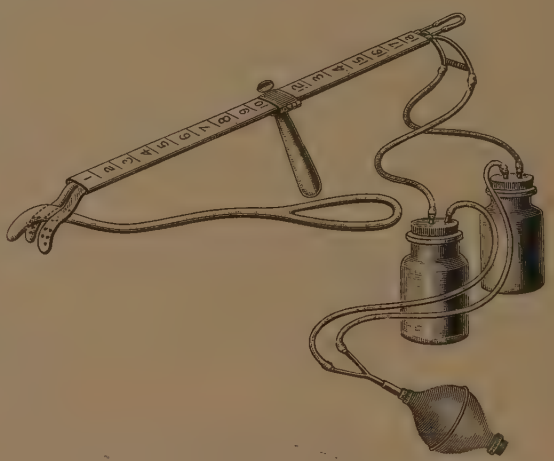


Fig. 53.—Harris' Double Catheter for Obtaining Urine from Kidneys Separately.

ABDOMINAL EXAMINATION.

96. Preliminaries.—The appearance of the patient and her subjective symptoms will indicate the necessity for an examination of the abdomen. The patient must have her clothing so adjusted that the entire surface of the abdomen can be exposed. She should lie in the dorsal position, upon an examining chair, bed, or table, with her limbs slightly flexed. A sheet is thrown over her lower extremities and drawn over the symphysis, when the clothing is raised and her abdomen exposed.

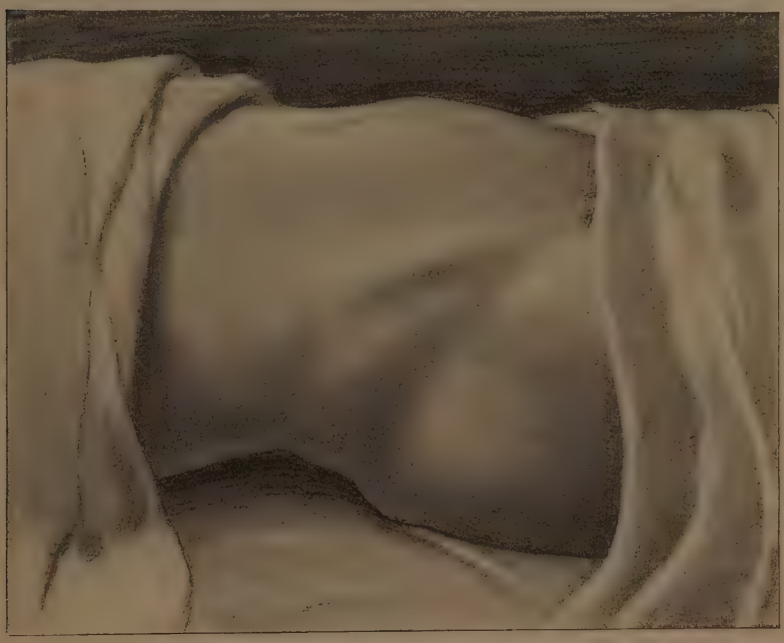


Fig. 54.—Abdomen Prepared for Examination.

97. Inspection.—An investigation of the external surface of the abdomen is of great value. The linea nigra, linea striata, and increase of pigment about the umbilicus and lower abdomen are signs indicative of a previous or present pregnancy. These discolorations having once occurred are never effaced, and are consequently of significance only during a first pregnancy. The linea striata are red or purple, when recent; white and glistening, when old. They are caused by overstretching of the skin, hence may result from any abdominal enlargement. Discolorations from blisters and counterirritants or scars from leech bites and wet cups

are indications of previous inflammation. The superficial abdominal veins are enlarged by any pressure upon the deeper vessels, and the enlargement occurs in pregnancy, in fibroid, ovarian and other large tumors. The subcutaneous tissues become edematous in general dropsy and from acute abdominal inflammation.

The abdominal enlargement is symmetric, irregular, or nodular; the abdomen is flattened and broadened in ascites, narrowed and projecting in pregnancy, myomata, and ovarian cysts. The tumor is spheric, most prominent above to the right in pregnancy, rises abruptly, attaining the greatest prominence near the umbilicus in ovarian cystomata, and is less likely to be symmetric in myomata. The surface of the skin is smooth and glistening from internal enlargement, and hangs in folds over the symphysis in obesity. A very dependent mass may be due to the protrusion of a large tumor between the separated recti muscles, or to a desmoid tumor of the abdominal walls. A large projection from the median line may be caused by a ventral hernia. Frequently the movements and outlines of the intestinal coils may be recognized. Fetal movements, contraction of muscles, and peristaltic action of the intestines can often be seen. Enlargements in the upper abdomen are due to growths in the liver, distention of the gall-bladder, enlargement of the kidney, or malignant disease of the ascending or transverse colon. In the median line the liver, stomach, pancreas, or transverse colon may be the seat of origin. Above, upon the left side, it may be the spleen, the left lobe of the liver, the cardiac end of the stomach, or the left kidney; and below, the descending colon. In the lower abdomen the genital organs afford the majority of abnormal growths. A tumor in the right inguinal region should always awaken a suspicion of appendiceal inflammation or malignant disease of the colon.

98. Palpation.—Palpation may be practised during the exercise of the preceding step. It consists in placing the hands, previously warmed, upon the bare abdomen, and gently moving them from side to side, now close together, or again bringing the entire abdomen between their grasp. The tips of the fingers or the entire hand may be applied. Palpation enables us to recognize the presence of an abnormal growth; its situation, mobility, density, and relation to the abdominal viscera. Its dimensions, smoothness, or irregularity are recognized by carefully outlining the tumor. The relations and mobility of the growth are determined by changing the position of the patient.

The patient generally should be placed upon her back, with the limbs flexed and the head and shoulders slightly elevated. The confidence and coöperation of the patient must be obtained in order to secure relaxation of the muscles. It is necessary to proceed with the utmost consideration and gentleness, as rough,

hasty, and inconsiderate palpation causes muscular rigidity and defeats the object. Pelvic abnormalities may require vaginal touch in conjunction with palpation, which has already been discussed under the bimanual examination. (Section 62.)

99. Difficulties.—Information may be rendered difficult to secure by palpation because of a large deposit of fat in the abdominal walls or rigidity of the muscles from fear or actual tenderness. The patient may in general be so reassured as to permit the investigation to be satisfactorily completed. In inflammatory collections it is often necessary to exercise care in the procedure to avoid rupture of the mass and the escape of its contents into the peritoneal cavity.

100. Percussion, though described separately, may be practised in conjunction with the two preceding steps. It consists in eliciting resonance or dulness by mediate or immediate percussion. Fluctuation is recognized by placing a hand upon one side and striking upon the abdomen, more or less remotely, with the finger-tips of the other. A long wave indicates that the fluid is free or contained in a large sac. A short or indistinct wave is produced by fluid contained in a sac with numerous partitions or septa. The chief value of percussion is in determining solid or fluid tumors from distentions of the abdomen by gas or ascites.

The ability to elicit resonance and dulness is utilized in the diagnosis between free fluid within the abdomen and that contained within a cyst. In the former a zone of resonance is elicited over the summit of the distention, while the remainder of the surface will be dull. The zone of resonance changes with the position of the patient, while in a cyst there is dulness over its surface and resonance above, and generally upon one side. In the latter the relative outline of the zones of resonance and dulness do not vary with change of position. The solid or cystic tumor, as it increases in size, pushes the viscera upward and to the opposite side; hence the situation of the zone of resonance. Resonance at the summit of the swelling in ascites is due to gas in the intestines, floating them to the surface. Should the mesentery be too short, from inflammation or great abdominal distention, to reach the surface, percussion gives dulness; while deeper pressure displaces the intervening layer of fluid, and again affords resonance. In localized peritoneal accumulations percussion aids only in defining their boundaries, and presents the sensation of fluctuation.

101. Auscultation is practised directly by placing the ear over the abdomen, with a towel or sheet intervening; and, indirectly, through the medium of a stethoscope. The former enables the physician rapidly to find the sound, the latter to study it minutely. Auscultation is of limited application. It enables us

to hear the fetal heart-sounds, the bruit produced by the rush of blood through the uterine sinuses, and various sounds induced by gas and liquids in the intestines. The fetal heart-sounds are characteristic of pregnancy; the bruit is heard in pregnancy and fibroid tumors alike. Efforts have been made to diagnose the seat of intestinal obstruction by the gurgling noise in the intestines, but our knowledge of the normal sounds is not sufficiently definite to enable us to make it of much value.

102. Exploratory Puncture.—Exploratory operations for the purpose of diagnosis may be one of two classes: *puncture* and *incision*. Puncture is divided into two procedures: tapping and aspiration. The former is applicable to the diagnosis and treatment of ascites; the latter, where it is desirable to lessen the size or to determine the contents of a cyst.

103. Tapping, or **paracentesis abdominis,** was at one time the only method of treating abdominal collections of fluid, whether free or confined within a cyst. The instruments used should consist of a trocar and cannula, about $\frac{1}{8}$ of an inch in diameter, to which a rubber tube may be attached. If Well's blunt cannula is used, a bistoury must be employed to make the incision. The

Fig. 55.—Nest of Trocars.

patient is placed upon her side near the edge of the bed; a point is selected in the median line, about midway between umbilicus and symphysis, which percussion has demonstrated to be free from intestine; and the surface is frozen by the application of ice and salt or a spray of ethyl chlorid. An incision is made through the skin, and the trocar is plunged, by a quick, rotating thrust, into the peritoneal cavity. The finger is held upon the instrument to govern the distance it is to be introduced. The trocar is withdrawn and a rubber tube is applied to the cannula to convey the fluid into a receptacle. The complete evacuation of the fluid is secured by pressing upon the abdomen toward the cannula. Arrest of the flow by the intestines floating against the end of the cannula can be obviated by changing its position. As the contents are evacuated the entrance of air into the abdomen may be prevented by keeping the end of the rubber tube submerged. The cannula is withdrawn and a piece of aseptic gauze is placed over the opening and held by a small strip of plaster. The withdrawal of a large quantity of liquid is frequently followed by symptoms of syncope. The patient should be kept in the

horizontal position, and, if necessary, given whisky or brandy (f℥j, per oram), spt. ammon. aromat. f℥j, well diluted, strychnin sulphate (gr. $\frac{1}{60}$ to $\frac{1}{30}$), atropin sulphate (gr. $\frac{1}{100}$), hypodermically, or inhalations of a few drops of amyl nitrite.

104. Aspiration should be the procedure chosen when it is desired to evacuate the contents of a cyst. The use of the trocar favors the entrance of air and of pathogenic germs, and its opening permits the escape of the cyst-contents into the peritoneal cavity, which not infrequently favor the development of peritonitis. The contents of a cyst should consequently be entirely removed if the wall has been perforated. The use of the hypodermic syringe for the withdrawal of a small quantity of fluid for examination is reprehensible. The patient encounters a greater risk from the escape of a portion of the contents of a tense cyst through even a small opening than can be compensated by any advantage derived through an examination of the fluid. For aspiration two instruments may be used, one of which will hold a few ounces, in which the needle is connected with the reservoir; the other, used in large accumulations, consists of a large air-pump connected by tubing with a needle, a quart bottle intervening (Fig. 56). Rapid suction exhausts the air in the bottle and causes the fluid to run until the cyst is emptied or the bottle filled. Strong suction when the cyst is nearly empty draws its sides into the needle and stops the flow. The withdrawal of the contents of the cyst is an advisable procedure when the pressure of the tumor is so great as to obstruct the circulation and lead to dyspnea, decreased renal secretion, and more or less anasarca. The operation in such cases, by facilitating restoration of secretion, promotes a favorable result in subsequent removal of the cyst. The procedure may be necessary, also, to prolong the life of the patient until a skilled operator can be secured. *Broad ligament cysts* are occasionally cured by aspiration. It affords an opportunity to clear up the diagnosis in otherwise obscure cases. Two conditions particularly can be determined by microscopic examination of the fluids. *Hydatid disease* is recognized by finding even a single hooklet. *Malignant disease* is determined by finding the presence of blood-corpuscles or particles of malignant tissue. The blood is mixed with the fluid. To examine it, the fluid should be drawn into a clean vessel,

Fig. 56.—Aspirator.

covered, and permitted to stand for twelve hours, when the blood-corpuscles will be found at the bottom or adherent to the sides of the vessel. *Tapping and aspiration* should always be done through the abdominal walls, never through the vagina or rectum, on account of the more difficult antisepsis and consequent greater danger of infection.

105. **Exploratory incision** in cases of difficult or doubtful diagnosis is a most effective method for making known the condition, but should be very infrequently practised. The more carefully the sense of touch is cultivated, the less frequently will an incision be required. The position of a patient who has nerved herself to undergo an abdominal operation, only to ascertain that her trial and suffering have been without avail, is most distressing, and is not calculated to lead the surgeon frequently to repeat it in cases of extremely doubtful character.

THERAPEUTICS.

106. **Classification.**—Gynecologic therapeutics may be divided into general and local, medical and surgical, and the time will not be misemployed if we consider the subject from the standpoint of preventive and curative.

107. **Extension.**—A cursory consideration renders it evident that the capable gynecologist must be versed in medicine, and must be able to distinguish genital affections from disturbances of other organs and to recognize the indications and contraindications for special methods of procedure.

108. **Infection.**—We need but to review the consideration of micro-organisms set forth under diagnosis to appreciate the importance of combating infection in its various manifestations. Not infrequently deaths following operations are attributed to heart failure, shock, pyelonephrosis, and pneumonia, when they are without question due to infection. Infection is more likely to reach a wound from unclean hands or instruments rather than through the atmosphere.

109. **Terms.**—The study of such conditions has originated the terms sepsis, antisepsis, and asepsis. Sepsis, of course, indicates the existence or sequela of infection; antisepsis, the use of agents which are either destructive to bacteria or hinder their baneful influence. Asepsis comprises the exercise of such means as shall exclude from the field of operation all pathogenic germs and their products. The latter is the ideal procedure, but when we have to deal with agents so intangible that it requires a microscope to discover their presence, and when it is absolutely impossible to preserve aseptic or sterile everything that may come

in contact with the affected tissues, a combination of the two methods seems the wiser plan of procedure.

Sterilization means the entire destruction or removal of germs. Complete sterilization of everything is an ideal asepsis.

110. Sterilization Methods.—The most effective agent for sterilization is the flame, but this can rarely be used because of its destructive influence upon the temper of instruments. It is employed to destroy worthless and dangerous objects, such as soiled dressings.

Heat may be employed in the dry and moist forms. The vegetative bacteria are destroyed by comparatively low temperatures, from 106° F. to 150° F. The spore-bearing bacilli require a higher temperature and stronger chemical solutions.

Sterilization by dry heat is infrequently employed, for the reason that a temperature of 284° F. for three hours is required to insure the destruction of the spore-producing microorganisms (Robb). It is rendered unavailable, not only by the time required, but it is injurious to instruments and destructive to ligatures and dressings.

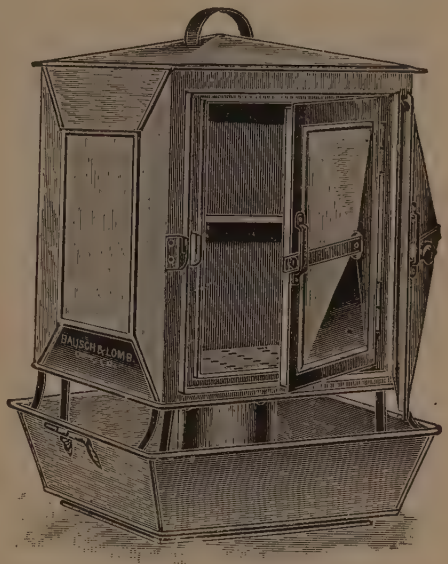


Fig. 57.—Arnold Steam Sterilizer.

An effective and easy method of sterilization is by the use of steam, which requires an apparatus from which the air can be expelled and the temperature maintained evenly at 212° F. A convenient and cheap apparatus for this purpose is an Arnold's copper sterilizer (Fig. 57). Ligatures and sutures may also be sterilized in the same way, but much more effectively by boiling. Silk will not stand long or repeated boiling without becoming friable. The towels, sheets, and operating gowns should be subjected to what is called the fractional method. This consists in placing the material in the sterilizer for one hour the first, and one half hour each succeeding day for two days. They should be carefully protected until used. When dry and properly protected, they will remain aseptic for an indefinite time.

111. Sterilization of Instruments.—The instruments for ex-

amination and operation should be capable of being thoroughly cleaned, and after every operation should be cleansed in hot water and boiled before the next operation. They should be placed in trays dry, or upon a sterile table. It was formerly the custom to place instruments in a five per cent. solution of carbolic acid. If the instruments are properly cleansed, the use of this agent is unnecessary, and in many operative procedures, particularly those upon the peritoneal cavity, it is objectionable, in that it causes irritation of the delicate structure of the peritoneum. The instruments should be sterilized before beginning an operation. Davidson says five minutes' boiling in water destroys all germs, but if the instruments have been used in pus or about gangrenous cases it is important that we should exercise still further precautions to render them absolutely sterile. They may be boiled for half an hour in a five per cent. solution of carbolic acid. The water should be boiling before the instruments are placed within it, or else they will rust. The latter can be avoided by using a one per cent. solution of carbonate of soda. This method of procedure affords a ready means of sterilizing an instrument which has been dropped during an operation. It has the advantage that any vessel can be used. The instrument trays—preferably of glass or porcelain, as being most readily disinfected—should be sterilized by heat, or, after careful washing with soap and hot water, should be filled to the brim with 1:500 solution of bichlorid. Trays should be emptied and washed out with plain sterilized water before the instruments are placed in them.

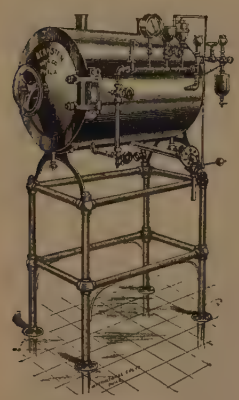


Fig. 58.—Steam-pressure Sterilizer.

Fig. 59.—Sterilizer for Boiling Instruments.

112. Sponges.—Sponges require more care and attention than any other part of the operation. I formerly used gauze pads made by taking a yard of gauze and folding it six or eight times, so that it made a pad from six to eight inches square. All selvage edges were turned in and whipped over by continuous

suture. These pads were boiled for half an hour, dried, and kept in sterile vessels ready for use. They were again boiled immediately before the operation. They were inexpensive, and, therefore, could be thrown away after each operation. The majority of operators now use dry gauze for sponges; pieces of gauze a yard in length are so folded that the raw edges are not exposed. They are done up in packages or placed in a metal receptacle so arranged that steam will pass through them, and are subjected to sterilization by the fractional method. They should be kept protected from dampness or any possible source of infection until used. The person who dispenses them at the operation should only handle them with a sterilized metal instrument. The greatest care must be exercised to make certain that all pieces of gauze are accounted for before closing the abdominal cavity. When the operator is to depend upon uncertain assistants, it is better to return to the smaller pieces of gauze, which can be washed and used over and over during the operation. When the operator prefers sponges, a good, fine, tough Turkish sponge should be chosen, using a definite number each of round and flat sponges. They should be carefully cleansed by being placed in a towel or bag and pounded with a cane until as much as possible of the dust and sand is removed. Then they are placed in water acidulated with muriatic acid sufficient to give a strong acid taste, in which they remain for twelve hours. This dissolves out the sand and earth. The sponges are then washed in green soap through a number of waters until they become perfectly clean, after which they are placed in a five per cent. solution of carbolic acid. A good plan of procedure in cleansing sponges is to place them in a solution of hyposulphite of soda—a pound of the salt to a gallon of water for each dozen sponges. Add to this an ounce of muriatic acid or half a pound of oxalic acid. The addition of the acid to the soda results in a double decomposition, in which sulphurous acid and sulphur are set free. The acid burns out the organic material in the sponge and at the same time bleaches it. Sponges should not be permitted to remain in this solution longer than from five to ten minutes. They are then washed in water until there is no longer any whitening of the water with the sulphur. They may then be placed in a five per cent. solution of carbolic acid. When the sponges have been used, they may be washed and used again, unless they have been soiled by

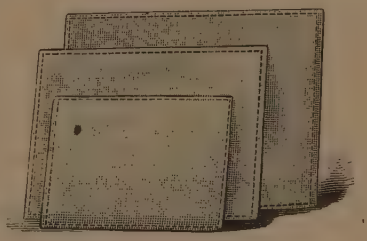


Fig. 60.—Gauze Pads.

contact with some special poison or infectious material, when they should be thrown away. In recleansing the sponges they should first be washed in cold water to remove the blood, then soaked in a solution of washing soda, half a pound to the gallon, and afterward in a solution of hyposulphite of soda and oxalic acid. The solution in which the sponges are kept should be changed every two or three weeks.

113. Ligature and Suture Material.—*Methods for Its Preparation and Preservation.*—The material used by the majority of operators is silk. Pozzi recommends that it shall be boiled with carbolic acid, 50: 1000, wound upon glass reels, and kept in this solution, which should be changed every week. Not too large a quantity should be prepared at a time, as the nearer to the operation, the less irritating it is. Hegar uses iodoform silk which is immersed twenty-four hours in iodoform 20 grams, ether 200 grams. This is dried, wound upon bottles, and kept in glass boxes. Silk may also be boiled in a sublimate solution (1 : 1000). Nilson recommends that suture material for superficial stitches should be boiled in wax and carbolic acid, as it is thus less likely to become infected. Apropos of this method, I used a suture of this kind in closing the lacerated perineum of a patient immediately following labor. Sutures were removed a week later. Two years subsequently, during examination of this patient I noticed a dark speck or groove upon the perineum, and on closer inspection found it to be a ligature that had not been removed. It was raised up, cut, and withdrawn, when it was found that it occupied a groove, which was completely cicatrized and apparently was not irritated. The possibility of infection of silk when used upon the stump of a suppurating tube, or in a pelvic cavity when suppuration is present, and the long-continued sinus that results until the ligature itself has discharged, have led me to prefer some material for ligation that is more certain to be absorbed and will not remain in the tissues so long. I have had occasion to open a sinus and remove a large ligature from a patient upon whom the operation had been done four years before, and the abscess did not form for three and one-half years. Consequently, for some time I have used nothing but catgut for ligatures and internal sutures. This material, when carefully prepared, is perfectly safe, and we have no reason to feel that the patient will experience inconvenience after convalescence occurs. Patients in whom no suppuration has occurred, nor sinus resulted, have subsequently suffered from pressure upon the nerve-fibers by an encysted ligature, requiring reoperation a year or more later for removal of the ligature in order to secure relief. *Catgut for ligature* is prepared as follows: No. 00, No. 0, and No. 2 catgut, as obtained from the shops in long pieces, is placed in ether

or benzin for a number of days, or even weeks, to extract the fat. It is removed from this and tightly wrapped upon wooden blocks or glass tumblers, and placed for thirty hours in a solution of bichromate of potash:

℞. Potasii bichromat., ... 1.5
Acid. carbolic., }
Glycerin., } .....āā 10.0
Aqua, ...480.0

The bichromate is dissolved in the water, and the carbolic acid and glycerin are added.

The previous fixing of the gut before its immersion in the solution is very important, as it otherwise becomes hopelessly twisted and entangled. After removal from the solution the strands should be wrapped upon previously prepared boards about a meter long, and while so wrapped it should be carefully dried. From these boards it is cut in meter lengths, and the pieces are tightly wrapped upon glass drainage-tubes. Each tube contains two pieces of gut. These tubes are placed in a 1: 1000 solution of sublimate in water for eight hours. This solution is poured off and replaced by a 1: 500 solution of sublimate in alcohol (90 per cent.), in which the catgut remains for twenty-four hours. From this solution the tubes are lifted by sterile forceps into absolute alcohol, to each half pint of which one dram of sterile glycerin has been added. The tubes are removed from this solution for use. Any unused catgut after an operation is not replaced.

The No. 2 gut is employed for ligatures, the No. 00 and No. 0 for sutures. Gut so prepared is, in my experience, unirritating and a satisfactory material for ligatures and sutures.

When it is not desired to harden the catgut or there is no need for its remaining in the tissues for such a length of time, the solution of bichromate of potash may be omitted. Boeckman suggests the following method of rendering the catgut safe for use. The gut, after being cleansed in ether, hardened if desired, and thoroughly dried, is cut into desirable lengths, wrapped in wax paper, sealed in small envelopes, and subjected to a temperature of a little above 284° F. for four hours. Pus-forming germs are destroyed at lower temperatures, but spore-bearing germs, as anthrax, so common in the intestine of the sheep, are killed only at the higher temperature. The envelopes remain unbroken until the catgut is desired for use. *Silkworm-gut* forms an excellent suture, is clean, not readily infected, and is easily taken care of. It may be boiled for ten minutes prior to the operation.

114. Dressings.—*Gauze* medicated with various germicidal or inhibitory agents has been advocated, but it does not present

any advantages over the sterilized gauze. The latter is non-irritating, and serves every purpose. It should be sterilized by subjecting it to steam. The fractional method, of course, being employed. It should be subjected one hour the first day, the second day half an hour, and the third day the same length of time, then dried in a hot oven and placed in a closed vessel, and kept carefully wrapped until it is used.

115. Operator and Assistants.—Personal cleanliness should be a matter of conscience. A person with nasal catarrh or bad breath from decayed teeth or foul stomach is disqualified to be either an operator or assistant. This is particularly true in peritoneal operations. Even the slightest examination should not be undertaken unless the hands and nails are carefully cleansed, in order to insure against the introduction of infectious material, and in every operative procedure the hands and arms should be scrubbed with soap and hot water, giving thorough attention to the condition of the nails. The longer the hands are scrubbed with soap and water, the less active are the germs that inhabit the surface beneath the finger-nails. After thorough washing with soap and hot water, the nails should be scraped and the washing again repeated. The fingers, and especially about the nails, should be scrubbed with a piece of sterile gauze wet with a 1 : 500 solution of bichlorid in 70 per cent. of alcohol, and subsequently washed in sterile water. Nurses and assistants who are to take part in the operation and handle sponges or dressings should be required to rigidly exercise the same precautions, and should be taught the importance of carefully avoiding contact with any nondisinfected article; and if they should accidentally touch a door, basin, clothing, the face, or any nonsterile object, they should again scrupulously cleanse their hands before coming in contact with dressings or instruments. Kelly advocates, subsequent to scrubbing the hands in soap and hot water, that they should be placed in a solution of permanganate of potash (4 : 1000), and this stain removed by washing in a concentrated solution of oxalic acid, then in lime-water, and finally in sterile water. From considerable experience I have been led to think well of the method suggested by Furbringer, who first washes with soap and hot water, then with bichlorid (preferably the acid solution), following with alcohol at 90 per cent. Probably the most effective method of cleansing the hands is to wash them with equal parts of sodium carbonate and calcium chlorid to which water is gradually added. The chlorin set free is the effective agent. There are but few persons, however, whose hands will endure the employment of this method of cleansing several times daily. Before examining a case of cancer where there is considerable decomposing material, it is

well to anoint the fingers with turpentine, and then with vaselin, as in this way the disagreeable odor is more readily removed from the fingers. It would be wise for the operator to wear rubber gloves or draw a condom over two fingers before examining cases of cancer or other infectious cases. A surgeon engaged in a general surgical practice would do wisely to wear rubber gloves when operating within the peritoneal cavity. Gloves should always be worn when the operator has recently examined or operated upon patients who were suffering from some infectious disease.

116. Precautions.—During the progress of an operation the operator should have, conveniently situated, two vessels, one containing a solution of 1: 1000 acid sublimate, and the second sterile water, into which he can occasionally dip his hands. In operations within the abdomen it is better that the bichlorid should be removed by sterile water. He should wear clean linen and should have his clothing entirely covered by a sterilized apron. When there is much fluid, as in plastic operations on the vagina, in which continued irrigation is practised, the clothing should be covered with some waterproof material beneath the apron.

117. Room and Environment.—The room and surroundings of the patient should receive careful consideration. The room should be well lighted and ventilated, and thoroughly cleaned; be free from matting, hangings, and everything that is likely to retain dust; in fact, no more furniture should remain in the room than is absolutely necessary. The operating room should be one whose walls can be thoroughly washed and carefully cleansed; the furniture should consist of metal and glass. When the operation is to be performed in a dwelling, the room should be carefully scrubbed with a carbolic acid solution (50: 1000) two days in advance. In a private house where the rooms are old or their condition at all suspicious, they should be disinfected with a formaldehyd apparatus. It was formerly the practice to operate under the carbolic acid spray, but it was found to have a prejudicial influence upon the peritoneum. Until quite recently some operators still kept a spray in the room for the moisture and to secure the beneficial influence of the carbolic acid, but the drug is so disagreeable and injurious to many patients that the practice has been discontinued. Sterilized water should be at hand in carefully covered vessels, and when antiseptic solutions are used, they should be designated so that no mistake can be made.

118. Examination and Preparation of Patient.—An examination should be made of the urine, as to its specific gravity, quantity of urea, presence or absence of albumin or sugar,

approximate quantity of solids, and where the conditions indicate it, the microscope should be employed. A fair estimate of the amount of solids may be obtained by Haine's modification of Haeser's method, viz.: "Multiply the last two figures of the specific gravity by the number of ounces of urine passed in twenty-four hours, and this product by one and one-tenth." This estimate includes urea and all other solids. The quantity will depend upon the avoirdupois of the patient. Etheridge has prepared the following table:

Weight.	Urinary Solids.	Weight.	Urinary Solids.
90 pounds	789 grains	140 pounds	1078 grains
100 "	854 "	150 "	1150 "
110 "	916 "	160 "	1198 "
120 "	974 "	170 "	1237 "
130 "	1028 "	180 "	1260 "

The performance of the respective functions of the heart and lungs should be investigated. Frequently an examination of the blood will be of service. While a low percentage of hemoglobin does not preclude operation (as I have performed a hysterectomy upon a patient with recovery in whom the hemoglobin was only 20 per cent.), it has, however, an important influence upon the healing of wounds and the convalescence of the patient. A careful blood examination is valuable, therefore, in the prognosis of operative conditions associated with anemia. The bowels should be thoroughly evacuated; this is particularly important when a plastic operation is to be performed upon the rectovaginal septum. The diet should be regulated according to the proposed operation. In peritoneal and intestinal operations milk and other foods containing much waste should be excluded.

A thorough evacuation of the bowels should be secured by the administration of half an ounce of Rochelle or Epsom salts, or two drams compound licorice powder, or half a bottle of magnesium citrate two nights previous to and the morning preceding the day set for the operation. A large rectal enema of soapsuds should be given the preceding night. The patient should be kept in bed for twenty-four hours prior to a serious operation. She should be given a general bath twice daily for two days, with special attention to washing the external genitals, the anus, and the depression of the umbilicus. Vaginal irrigation with 1 : 2000 sublimate solution should accompany each bath. The abdomen and genitalia should be shaved the evening before the operation and the abdomen should be washed with tincture of green soap and hot water, the flesh-brush being diligently applied. If the patient is uncleanly or the skin is oily, the surface should be washed with ether, then with soap and

water, and finally with a (1: 1000) sublimate solution. This washing should be repeated on the morning of the operation, and the abdomen should then be covered with a pad saturated with sublimate solution, which should be retained by a bandage, to be removed when upon the operating table. In all cases it is desirable that the field of operation should be again thoroughly scrubbed after the administration of an anesthetic, with soap and hot water, the superficial soap being removed with alcohol.

119. Special Preparation.—*Vaginal Operation.*—The first step should consist in a careful cleansing of the vagina. For this purpose a combination of creolin with green soap is very effectual, using creolin one or two drams, green soap one or two ounces, to the quart of hot water. The vaginal canal should be thoroughly scrubbed with this solution, introducing two fingers wrapped with gauze. This procedure will remove all debris which may have lodged in the crypts and folds of the vagina. The solution should be removed by washing with sterilized water and then with alcohol. Creolin is not so effective an agent in sterilizing the vagina as the acid sublimate solution, but it has the advantage that it leaves the vagina soft and flexible, which is an important

Fig. 61.—Irrigating Glass Tube. Open End.

consideration in *obstetrics* as well as in all operative procedures upon the vagina. The bichlorid and carbolic acid solutions, on the other hand, have a constringing effect upon the vagina, which renders it less elastic.

120. Irrigating Tubes.—All the cannula used for the purpose of cleansing the vagina should be made of glass (Fig. 61), as they are more readily cleansed, are less likely to contain infectious material, and are sufficiently cheap to permit them to be thrown away when used in suspicious cases. If injections are used by the patient, there should be no central opening of the nozle, for the reason that it may be introduced directly into a patulous cervical canal, and fluid thrown with force into the cavity results in severe uterine colic. Indeed, fluids have been thrown into the uterus and forced by uterine contraction into the tubes, which caused serious, if not fatal, pelvic inflammation. There is no special advantage in having a curved cannula or tube for irrigation. The nozle used by the physician in an operation should have but a single orifice, and that should be a central one. After irrigation has been practised, pressure should be made

upon the fourchet, to insure the entire escape of fluid. It is sometimes advised that the irrigation should follow the examination or operation, but we can not too strongly impress upon the student the fact that the genital canal sometimes contains dangerous germs, and that antisepsis must precede as well as follow an operation. In cancer or sloughing fibroids we may, in addition to the ordinary disinfection, require the use of deodorizing agents. For this purpose a three to five per cent. solution of thymol or two or three tablespoonfuls of Labarraque's solution to the quart of water may be used.

121. Gauze.—After the uterus and vagina are carefully cleansed the canal can be packed, if preferred, with iodoform or other antiseptic gauze which will remain sweet for a number of days. Iodoform is preferable to the simple sterilized gauze. To prepare it, ten layers of plain gauze are sterilized by boiling, preferably in a solution of carbonate of potash, washed, then soaked in a solution consisting of iodoform 50, glycerin 100, and ether 700 parts, after which the gauze is passed through a wringer and dried in a darkened isolated room at a temperature of 85° F. When dry, it is placed in tin boxes. This gauze should always be sterilized before its use. This can best be accomplished by heating it to the temperature of 250° F., by which both germs and their spores are destroyed. It should be remembered that iodoform is not a germicide. Its value is in its reductive influence upon the ptomains and leucomains, by which their deleterious effects are arrested. Iodoform is poisonous to some patients. Sometimes it produces high temperature, irritation of the skin, and a smoky, darkened urine, and in others, extreme disturbance of the digestive tract. In such idiosyncrasies one of the other forms of antiseptic gauze should be preferred. These comprise borated, salicylated, carbolized, formalized, and acetanilid gauze. Sublimated gauze can be made by first boiling it in a solution of carbonate of potash (20: 1000), then an hour in a (1: 1000) sublimate solution, when it is dried in a sterilizing oven and preserved in closed glass jars. Salol and iodol are inferior in their action to iodoform. Carbolic acid is unreliable. Aristol, an agent that is made by the combination of thymol and iodin, is probably preferable to iodoform. It has the advantage of the absence of disagreeable odor. The powder is very dry, not rapidly soluble, and coats over and protects the surface.

122. Antisepsis of the cervix and uterine cavity is secured by intra-uterine injections of sublimate solution, carbolic acid, peroxid of hydrogen, or, preferably, formalin (1: 1000). Of the solutions of mercury, the acid sublimate is preferable, for the reason that it does not form an albuminate of mercury by combination with the serum of the blood, and is less likely to be

absorbed and to produce a toxic effect. This agent is not so dangerous as in obstetrics, unless there has been a large denuded surface. In such cases its use should be followed by an injection of sterilized water. In intra-uterine injections a double catheter should be employed, in order that the return flow may not be obstructed. It may be made of hard rubber, glass, celluloid, or metal; the last-named are more likely to be acted upon by the mercury salts. If the uterine cavity is well dilated, the double tube will be unnecessary. After the cavity is carefully cleansed it may be packed with an iodoform gauze tampon, or a pencil of iodoform may be introduced. Von Hacker recommends the following: Iodoform, 5 drams; gum acacia, glycerin, starch, each 30 grains; mix, make pencils, introduce into the cavity of the uterus. When these pencils give rise to uterine colic, it may be preferable to dust the cavity with iodoform through an insufflator, or, still better, the use of aristol by the same means.

In sloughing fibroids or intra-uterine cancer the cavity should be irrigated with an acid sublimate solution (1 : 2000), followed either by sterilized water or a solution of chlorid of sodium (6 : 1000). In operations upon the vagina or cervix continuous irrigation may be practised, using for this purpose a solution of carbolic acid (5 : 1000), sublimate (1 : 2000), formalin (1 : 1000), or, better, chlorid of sodium (6 : 1000). The irrigation washes away the blood, renders unnecessary the use of sponges, and the surfaces are constantly kept bathed with the antiseptic fluid. It is the preferable procedure in all operations upon the vulva, vagina, and cervix.

123. The Use of Tents.—In dilating the uterus the sponge, tupelo, or laminaria tents, although carefully disinfected, are not without danger. Pozzi recommends the latter tent, but he first immerses it in a saturated solution of carbolic acid and rectified spirits, or in a solution of iodoform and ether with a tenth part alcohol. The objection to the use of tents is the difficulty in previously sterilizing the uterine canal. Unless it is thoroughly done, as you would in the performance of any operation, the patient is in danger of subsequent inflammatory attacks. For this reason, in the majority of dilatations, I prefer to use the bougies and accomplish rapid dilatation in preference to the slower procedure with the tent.

124. Abdominal Section.—The peritoneum is a membrane exceedingly susceptible to the influence of all chemic agents, and its delicate structure would be injured or destroyed by any agent of sufficient strength to have a germicidal influence; consequently, our aim should be rather to procure asepsis than antisepsis. Assistants must be personally clean. They should have taken a thorough bath on the morning of the operation and should have

seen no case of contagious disease prior to its performance. They should remove their coats and vests, roll up their clothing to the elbows, thoroughly scrub their hands and arms with soap and hot water, and wash in disinfectant solutions. Their clothing should be covered with clean sterile linen. They should subsequently avoid shaking hands or touching any objects not disinfected. The operator should postpone the operation if he has the smallest suppurating sore on his hands, or should wear a pair of rubber gloves, to prevent infection of the wound.

125. Indications for Anesthesia.—The use of some anesthetic is necessary in the performance of many operations, and is of great advantage in all. In the virgin, in nervous patients, or those in whom the abdominal and pelvic organs are very tender from the presence of inflammation, the administration of an anesthetic renders an examination much more satisfactory to the physician and less distressing to the patient.

126. Agents Employed.—In an examination it is undesirable that the patient should be long under the influence of an anesthetic or should have a large quantity administered. *Ether* and *chloroform* are objectionable, first, because of the length of time required to secure insensibility and recover consciousness; second, the subsequent nausea and vomiting, which frequently last for hours. *Nitrous oxid gas* is an agent which produces prompt unconsciousness, and from which the patient as promptly recovers, but it requires a special, quite expensive, and rather unwieldy apparatus.

Bromid of ethyl is almost as rapid in its effects as the nitrous oxid, requires but a small quantity, the patient regains consciousness almost immediately after the inhalation is discontinued, and its use is much less frequently followed by nausea and vomiting. It can be administered in one's office, and the patient shortly after return to her home, feeling but little the worse for her experience. This agent is very satisfactory for short operations, such as opening abscesses or dilatation of the urethra or anus. In very nervous patients it may precede the administration of ether or chloroform, whereby the stage of excitement and struggling is avoided. With the assistance of Dr. P. B. Bland I have been lately experimenting with the use of chlorid of ethyl, and find it acts very satisfactorily in producing quick anesthesia. This drug has been employed in the performance of serious operations, such as hysterectomy, etc. I myself have used it during the performance of various abdominal operations, having had patients under its influence as long as fifty minutes without any ill symptoms. It has not seemed to produce any uncomfortable sensations following the operation, although the anesthesia is not as profound and

durable as that induced by other anesthetics. For prolonged operations ether and chloroform are to be preferred. *Ether* is generally recognized as the safer drug. In the very young or the aged it is less satisfactory than chloroform, and probably not so safe. *Chloroform* should be preferred in the presence of renal disturbance and when the patient is suffering from emphysema or chronic bronchitis. Some of the French surgeons advocate the administration of $\frac{1}{6}$ of a gr. of sulphate of morphin and $\frac{1}{100}$ of a gr. of sulphate of atropin hypodermically about twenty minutes prior to the administration of chloroform, and they claim: (1) that it increases the safety by diminishing the danger of syncope; (2) that the patient is much

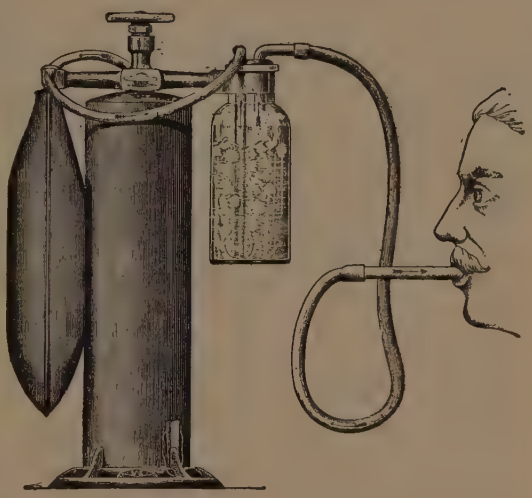


Fig. 62.—White's Oxygen Apparatus, which can be Utilized for Anesthesia by Placing Anesthetic in the Bottle.

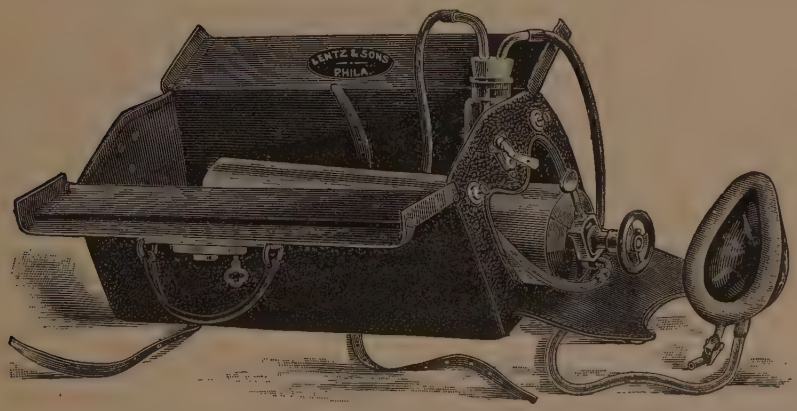


Fig. 63.—Northrup's Apparatus for Administering a Mixture of Chloroform and Oxygen.

less likely to suffer from nausea and vomiting; (3) that the patient, having taken a smaller amount of the vapor, recovers

consciousness more quickly. The administration of a mixture of *chloroform* and *oxygen*, obtained by passing oxygen through a bottle of chloroform to the inhaler, decreases the danger of this agent and accomplishes anesthesia with the minimum quantity of the drug, without discomfort, with lessened nausea, and with slight subsequent distress. (Figs. 62 and 63.) The patient does not have the blanched appearance of the face, and rapidly recovers when its administration is suspended. We do not feel it necessary to describe the administration of the anesthetic further than to caution that false teeth and foreign bodies should be removed from the mouth.

127. Administration.—The patient should be directed to breathe deeply. She should be reassured by the physician, both in speech and manner. Talking upon the part of the administrator or attendants should be avoided. The pulse, respiration, and condition of the pupil should be continually observed. Dilatation of pupils, blanching of the face, arrested or stertorous breathing, and sudden feebleness of the pulse should indicate the temporary withdrawal of the vapor. Continued syncope, particularly in chloroform narcosis, requires resort to artificial respiration, and often suspension of the patient with head downward. The administrator of the anesthetic should be provided with a hypodermic syringe, solutions of strychnin and atropin, and some nitrite of amyl. The latter agent is of advantage because of its rapid action as a primary heart stimulant, and its influence in dilating the arterioles by its action upon the vasomotor system. When chloroform is largely given, a bellows and mask, by which the lungs can be inflated with air, will not infrequently be effective in saving life. In suspended respiration forcible pulling upon the tongue acts as a respiratory stimulant. The inhalation of vinegar following anesthesia appears to lessen the tendency to nausea.

128. Local Anesthesia.—General anesthesia is attended with danger in renal disease, in marked pulmonary changes, in fatty degeneration of the heart, and in atheroma of the large vessels. In such cases, and when general anesthesia is objectionable, local anesthesia may be employed. Freezing by ice and salt, by ether, or by ethyl chlorid spray may be utilized, but its application is limited. Continuous irrigation with carbolic acid has a benumbing effect upon the mucous surfaces, by which pain is obtunded.

Cocain.—The most effective agent for local anesthesia is one of the cocain salts. In operations about the genitals or anus it is preferably given hypodermically, and for this purpose the phenate of cocain is the most satisfactory. It is slower in being absorbed, and is less likely to be a source of infection

from the presence of micro-organisms. The injections should be made with a one or two per cent. solution, using as much as from one to three grains of the drug. The injection produces anesthesia for the distance of half an inch from the point of the needle; consequently a number of injections may be required. This method of anesthesia has been effective in amputation of the cervix, trachelorrhaphy, and operations upon hemorrhoids and fistula in ano. The drug sometimes has an alarmingly depressing effect. This symptom, it is said, may be avoided by combining nitroglycerin in the injection. When symptoms of depression occur, resort should be had to strychnin, atropin, alcoholic preparations, and nitroglycerin.

Schleich, of Germany, after considerable experimentation, has suggested three solutions for *infiltration anesthesia*. The basis of all is a solution of two parts sodium chlorid, one-fourth part morphin hydrochlorate, in water one thousand parts, to which, for what is called the stronger solution, two parts cocain hydrochlorate are added—one part for the medium and one-tenth part for the weaker solution. The water and salt are sterilized by heat. A larger syringe than usual is used. The site for operation is carefully cleansed; then, after numbing the surface with an ethyl chlorid spray, a puncture is made and fluid injected until a wheal the size of a dime is raised; the needle is introduced in its margin, and so continued until the entire length of the proposed wound is completed. The first puncture is the only painful one. The insensibility of the skin lasts for from fifteen to twenty minutes.

Spinal anesthesia is secured by the injection of one to two grams of a sterilized (2 per cent.) solution of cocain into the spinal cavity. The injection is made between the lumbar vertebræ, and on a line level with the crests of the ilia. A long needle is introduced, the entrance of which into the spinal canal is indicated by the escape of spinal fluid. This form of anesthesia has been largely practised by Tuffier, of Paris, who has observed no untoward symptoms and has found it very satisfactory in all operations below the diaphragm. In a patient who had had one kidney removed and the remaining one so diseased as to render the employment of a general anesthetic unwise, under this method I opened up a sinus which extended down to the vertebræ and into the pelvis without pain to the patient, and without the depression and horrible nausea which had been associated with her previous operations. A second patient, a young girl, who had a large necrotic ovarian cyst, a portion of one lung consolidated, and a mitral murmur with beginning cardiac inefficiency,—factors which made her condition very unfavorable for ether or chloroform narcosis;

spinal anesthesia was employed, and I was able to remove the tumor without pain, and the patient had an uninterrupted recovery.

129. Preliminary Details of Operation.—The presence of the patient, anesthetized, in the operating room presupposes the thorough preparation detailed in the previous paragraphs. A sufficient number of well-drilled assistants should have their duties assigned, so that the operation may proceed without confusion or delay. Instruments, ligatures, dressings, sterilized water, and sponges have been prepared. In abdominal operations the number of sponges should be known, so that they may be accounted for before the wound is closed. It is also important to have a definite number of instruments, as both sponges and instruments, especially hemostatic forceps, have been left in the abdominal cavity. Every step of the operation, to the minutest detail, should be conscientiously watched, for, as the chain is only as strong as its weakest link, so an otherwise perfect aseptic procedure may fail through a single flaw. I have seen the most careful preparations for an operation, and the operator place his silk sutures upon a syringe box; an assistant stroke his mustache, a nurse use her handkerchief, each instance being a break which imperils the result.

130. Arrangement.—The instruments should be placed at the right of the operator, so that he can reach them as needed. The sponges should be in the care of a nurse upon the opposite side. The sponges and gauze should be removed from the receptacle and passed to the operator or his assistant by the nurse with a pair of forceps. After being used they should be placed in a basin. The nurse dispensing the sponges should keep an accurate record of the number given out, with which those returned should correspond. The wound should not be closed until it is certain all sponges have been removed. It is well to have one large, broad piece of gauze for walling off the intestines, or several smaller pieces may be employed and the end of each secured with a pair of forceps. A basin of sterilized hot water should be alongside the instruments for the hands of the operator, and his principal assistant should have another.

131. Positions of Operator and Assistants.—In an abdominal section I prefer to stand on the patient's left, with my assistant opposite; the second assistant gives the anesthetic; a third looks after the instruments, ligatures, and sutures. One nurse attends to the sponges, a second changes the water in the basins, especially in those for the hands of the operator and assistant and prepares sterilized water or salt solution for irrigation. A third may be ready for emergency and have the dressings ready upon the completion of the operation.

132. Clothing of Patient.—The patient will be better to have all clothing removed, in order to prevent it becoming soiled during the operation. Clean blankets should be wrapped about the upper part of the body and the lower extremities.

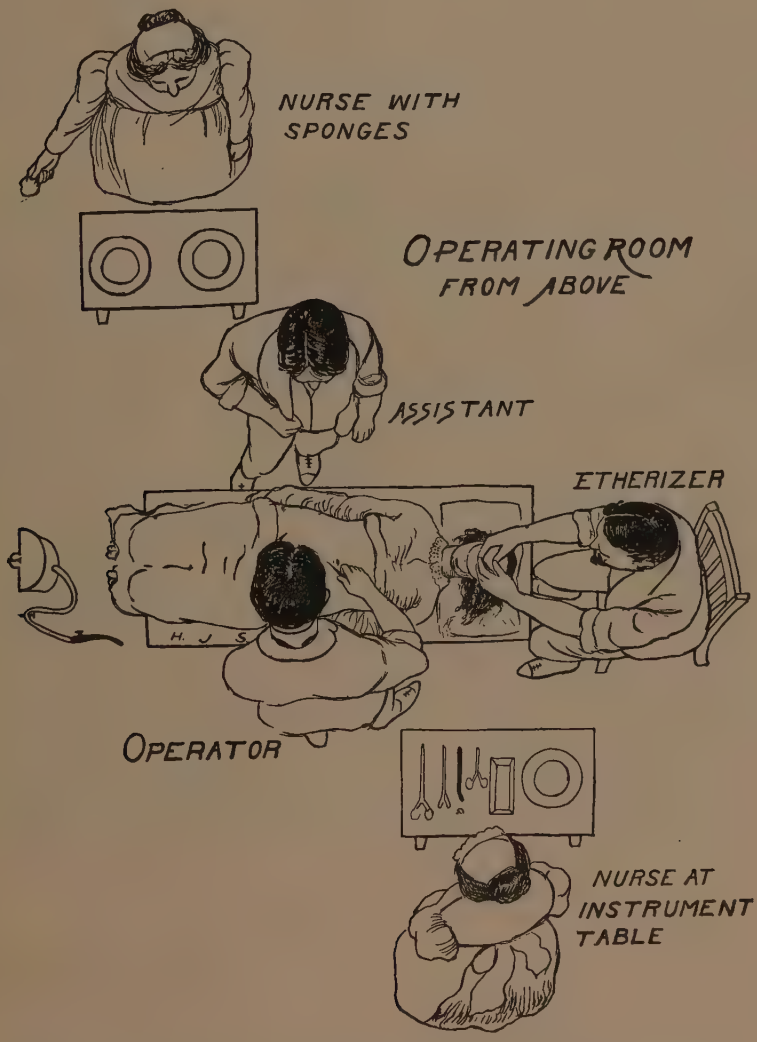


Fig. 64.—Arrangement of Tables and Assistants in Operating Room.

These should be covered with sterilized towels, and over all a sterilized sheet, in the center of which an opening has been prepared for exposure of the field of operation.

133. Incision.—The linea alba is chosen for the site of incision in the majority of cases of abdominal section. A cut, varying in length from two to twelve inches, according to the condition for which the operation is done, is made with a sharp knife. When the abdomen is moderately distended with a growth, the first sweep of the knife should reach the fascia over the peritoneum. The operator and his assistant with long dissecting forceps pick up the peritoneum and cut it between them, thus avoiding injury to the cyst, or, when the abdomen is undistended, a knuckle of intestine.

Fig. 65.—Abdominal Wall Incised; Peritoneum Picked up by Dissecting Forceps.

Fig. 66.—Peritoneum Incised.

As soon as the peritoneum is opened the atmospheric pressure carries the intestine out of the way, when the incision may be completed with a knife or with probe-pointed scissors, introducing two fingers as a guard. Should considerable bleeding occur after the first sweep of the knife, it can usually be controlled by pressure with a gauze pad wrung out of hot water. When this is insufficient, the bleeding vessels should be seized with hemostatic forceps.

The length of the incision has been a prolific source of discussion. It has but little influence upon the result. It should be sufficiently long to permit the object of the operation to be accomplished with ease and as little irritation as possible. A long incision, if properly united, will be as firm as a short one.

134. Adhesions.—In inflammation complicating a cyst it may be difficult to determine when we are through the peritoneum. In case of doubt it is better to continue the incision until the cyst is opened, when the line of union can be more

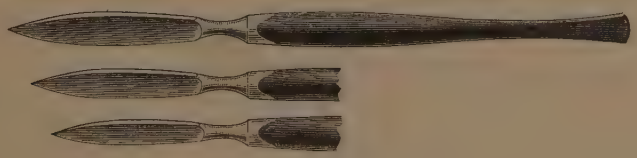


Fig. 67.—Scalpels.

readily determined. It is well to remember that at the umbilicus the peritoneum is closely united to the overlying tissue, and this fact may be utilized in cases of uncertainty. As far as possible, separation of adhesions should take place under the eye, by drawing them down to the incision. Vascular adhesions and every bleeding vessel should be secured with forceps or should be ligated.

With the application of forceps the number of necessary ligations will be reduced, as the pressure will often prevent subsequent bleeding. The wound should not be closed if any large bleeding points are present. In short, firm intestinal adhesions the greatest safety is assured by keeping close to the cyst. In some cases it may be necessary to cut into the cyst, leaving a portion attached to the intestine, always taking the precaution, however, to remove its inner, secreting surface.

Fig. 68.—Pressure Forceps.

135. Toilet of the Peritoneum.—In the removal of large cysts care should be exercised that their contents do not escape into the abdomen. If the contents are uncontaminated, consisting of thin, serous fluid, it should be removed by sponging only. It is difficult for me as an operator to get over early impressions. My education leads me to resort to abdominal

irrigation, preferably with normal salt solution, whenever infection is possible, but experience has demonstrated that patients do equally well when pus is sponged out as when irrigated. It is a serious question whether the measures we often institute in the name of toilet of the peritoneum are not more prejudicial than helpful. When irrigation is done it is most effectively accomplished by pouring the belly full of normal salt solution, churning it about, pressing it out, and removing the

Fig. 69.—Dissecting Forceps—Long Bladed.

remainder with sponges. All bleeding points must be secured. If there is oozing from the surface, sponges wrung out of hot water should be packed firmly upon it until the operation is completed, when they can be removed. If bleeding still continues, the surface should be sponged with a hot solution (10 per cent.) of ferripyrin, or a spray of a 4 per cent. solution of antipyrin may be employed. Should hemorrhage be persistent, a gauze pack affords an efficient means of control.

136. Drainage.—The question of drainage was formerly a momentous one. Keith's rule that it should be used only when there was something to drain was a good one, but with improved methods of technic we can depend more and more upon the natural absorptive power of the peritoneum. The employment of the glass drainage-tube, which was formerly a matter of routine, is now more honored in the breach than in the observance. When a glass drainage-tube is employed, it should be from six to eight inches long, with a number of small perforations at the lower extremity. These openings should be small, otherwise portions of intestine or omentum slip into them and become strangulated or render the removal of the tube painfully difficult. The openings should be smooth, and should be beveled at the expense of the outer surface. The lower end of the tube should be open; the external end should be provided with a flange, over which a piece of rubber dam may be placed to prevent soiling of the dressings. The caliber of the tube should not exceed one-third of an inch. The use

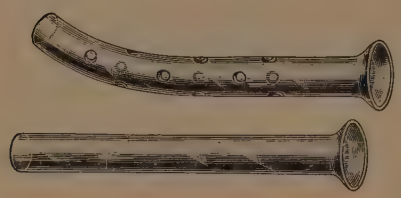


Fig. 70.—Glass Drainage-tubes.

of the drainage-tube required most exacting care upon the part of the nurse and the physician. Every precaution had to be exercised to prevent it becoming a gateway for the entrance of infection. It needed to be cleaned every half hour or oftener so long as there was any discharge. This was accomplished by the use of a suction tube which reached to the bottom of

Fig. 71.—Uterine Syringe for Cleansing Drainage-tube.

the tube, or, better, by tube-forceps and pledgets of sterilized absorbent cotton. The frequent cleansing of the tube was avoided by passing a strip of sterile gauze to its bottom, which acted as a wick.

137. Objections to Drainage.—The glass drain was objectionable because: (1) It obliged the patient to remain upon

Fig. 72.—Tube Forceps for Cotton Pledgets.

her back; (2) unless carefully placed it caused sufficient pressure upon the rectum to produce ulceration and even a fecal fistula; (3) it increased the difficulty in maintaining the wound aseptic, and afforded ingress to pathogenic germs, either through its cavity or along its sides; (4) it rendered the abdomen weak and increased the danger of ventral hernia; (5) it endangered the formation of a sinus which was long in closing. The frequency with which drainage was thought to be required, it was found, could be lessened by the introduction of large quantities of normal salt solution, by which the infectious material was diluted and rendered more readily controlled by the peritoneum. Later experience has demonstrated that such cases do equally well by careful walling-off of pus col-

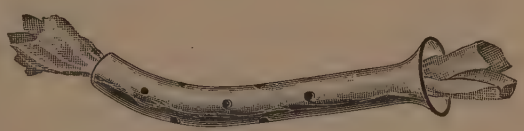


Fig. 73.—Gauze Wick in Drain.

lections with gauze before they rupture and then thoroughly removing the pus and blood with dry gauze. The peritoneum, if given an opportunity, will take care of infection; the means which have been employed for the removal of infection have crippled the antagonistic processes of the peritoneum.

138. Gauze Drain.—Drainage has been accomplished by a twist of gauze, or, where there was much oozing, by gauze pressure. The Mikulicz drain consisted of a piece of gauze with a string tied to its center, placed in the bottom of the

Fig. 74.—Mikulicz Drain.

pelvis, within which strips of gauze were packed. These strips were ordinarily marked, to designate the order in which they were introduced. The pain in removing was greatly decreased by covering it with rubber tissue except at its extremity. Drainage, whether by tube or gauze, is of but short duration, and its influence is confined to a limited area. Lymph exudate soon walls it off as a foreign body from the general cavity. The gauze is very efficacious as a tampon. Its pressure arrests hemorrhage and promotes the formation of exudation which

closes oozing vessels and bars the avenues for the entrance of infection.

139. Where Placed.—The drain, whether glass tube or gauze, was generally placed in the lower angle of the wound, though it could be placed between sutures at whatever part of the wound was most favorable.

140. Postural Drainage.—The uninjured peritoneum is a very active absorbing surface, and Clark utilized the knowledge of this fact to avoid the introduction of a drain by elevating the foot of the bed eighteen inches for from twenty-four to thirty-six hours, by which the fluid gravitated away from the injured surfaces. The danger of infection was lessened by active irrigation with a large quantity of normal salt solution before the wound was closed. The activity of any pathogenic material remaining within the abdomen was diminished by dilution, through the retention of a considerable quantity of the solution when the wound was closed.

This position also decreases the pain following an operation by the lessened quantity of blood sent into the vessels of the elevated pelvis.

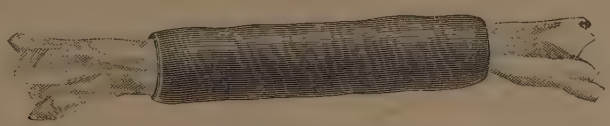


Fig. 75.—Gauze Drain Covered with Rubber Tissue.

141. Closure of the Wound.—Before the sutures are introduced the omentum is generally drawn over the intestines. Formerly when extensive adhesions or purulent discharges were present the belly was left filled with a sterile normal salt solution. While we now urge the dry gauze sponge, it is yet difficult not to resort to the flushing with normal salt water when abscess cavities are ruptured. The wound can be closed by through-and-through interrupted sutures or with buried sutures in separate layers. The interrupted sutures of silk, silkworm-gut, and silver wire or chromic catgut are introduced through the entire thickness of the abdominal wall, about three-fourths to one inch apart, including one-eighth of an inch of the peritoneal and one-fourth of the skin surface on each side. Each suture is secured with a pair of hemostats, and after all are introduced the gauze pad placed over the intestines is removed, the cavity is inspected, and the sutures are tied. Care has to be exercised that a knuckle of intestine or a piece of omentum is not caught by the sutures. The most important consideration for the future of the patient is the

union of the aponeurosis, for upon its accurate union depends the subsequent strength of the abdominal wall.

Edebohls closed the peritoneum, muscle, and aponeurosis with No. oo or No. o chromicized catgut. Beginning at the upper angle of the wound, a continuous suture was passed through the peritoneum and lower half of the muscle, until the lower angle of the wound was reached; then, returning with the same suture, the upper half of the muscle and the aponeurosis were united, tying to the free end at the upper angle one knot for the double suture. A method of suturing has been suggested by Haughey, of Battle Creek, Mich., which consists of a continuous suture each of silkworm-gut for peritoneum, aponeurosis, and skin; the ends of each suture are brought out through the skin near the angle of the wound, and secure by perforated shot compressed over small aluminium plates. The skin suture is subcuticular. A more satisfactory method of wound closing, in my experience, is first to close the peritoneum with a continuous suture of catgut, which is left untied, then interrupted sutures of silkworm-gut, each of which includes the entire wall above the peritoneum; before these are

Fig. 76.—Curved and Straight Needles.

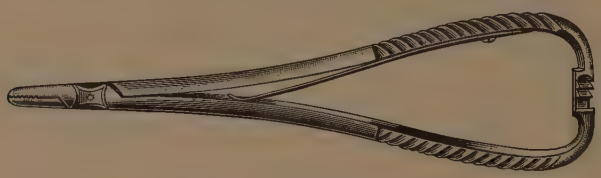


Fig. 77.—Needle Forceps.

tied the surface is carefully dried and the aponeurosis is approximated and secured, the same piece of catgut which closed the peritoneum carried in the reverse direction, and the two ends are tied at the starting-point, thus making but one buried knot. The interrupted sutures are then tied sufficiently close to hold the surfaces snugly in apposition, without undue tension.

142. Dressing.—After the wound is closed it is washed with alcohol and a sterile towel is pressed upon it, while the remaining surface of the abdomen is being cleansed and dried. The wound surface may be dusted with iodoform and boric

acid (1 : 7), with acetanilid powder, which is fully as effective and much cheaper, while free from disagreeable odor, or it does equally well without anything intervening between it and the gauze. I prefer to place over the wound sterile gauze, upon which is placed a thick layer of sterilized nonabsorbent cotton, enveloped by a piece of sterile gauze,—all of which are held in place with tapes attached to pieces of plaster, three

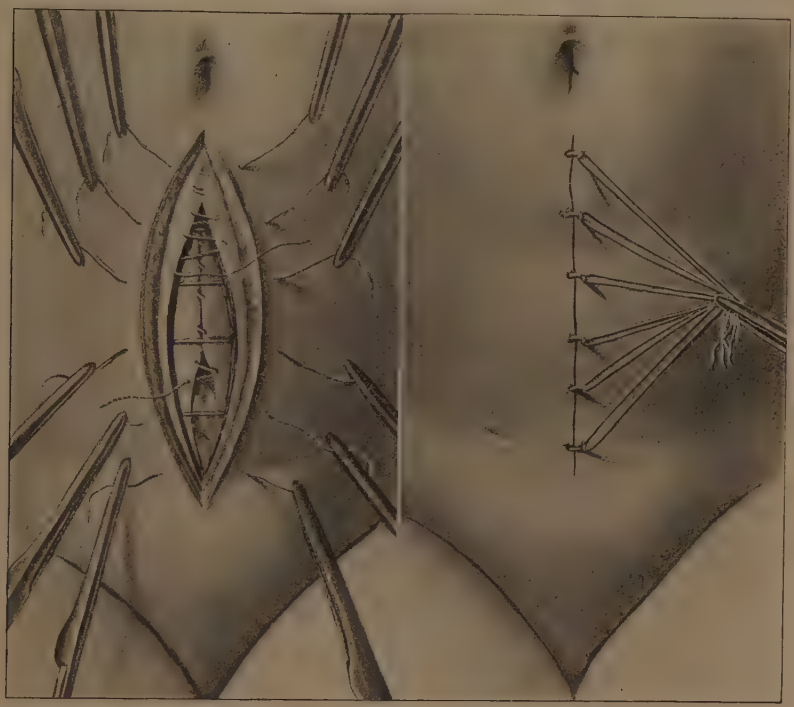


Fig. 78.—1. Peritoneum Nearly Closed with Continuous Catgut. 2. Silkworm-gut Sutures through All Structures above Peritoneum. 3. Aponeurosis Being United with Continuous Suture of Catgut.

Fig. 79.—Silkworm-gut Sutures Tied.

on each side,—and, finally, a sterilized bandage. The use of the tapes affords a ready access to the wound without annoyance to the patient.

143. Postoperative Treatment.—The most frequent procedures, both before and after an operation, which should receive consideration are the use of the hypodermic syringe and catheter. I have frequently seen serious septic processes

develop from the use of the hypodermic needle, and many patients suffer more from the careless use of the catheter than they did from the condition for which the operation was performed.

144. Precautions in the Use of the Hypodermic Syringe.—In the use of the hypodermic syringe there are four sources of infection: (1) The hands of the operator; (2) the instrument; (3) the fluids to be injected; and (4) the skin of the patient. The syringe is difficult to keep aseptic. The metal instrument may be boiled in a soda solution. If you have a glass instrument the piston should be withdrawn and it and the barrel should be placed in a five per cent. solution of carbolic acid; the needles, if platinum, may be passed through an alcohol flame, but ordinary needles would be destroyed, and, therefore, they should be boiled. Solutions of atropin, morphin, cocain, strychnin, and ergotin favor the development of bacteria, and when kept for some time, will be found swarming with microorganisms. Cocain may be kept in a (1 : 10,000) bichlorid solution; the others named may be preserved by the addition of a few drops of carbolic acid to the ounce of solution. Probably the safest method is to make up the solution of morphin, atropin, or strychnin from tablets, which can be dissolved by boiling without affecting the action of the drug.

145. Catheterization.—No procedure, fraught with so much discomfort to the patient when carelessly employed, is so frequently performed with so little consideration as is the use of the catheter. We have to regard not only the distressing symptoms produced by infection of the urethra and bladder, but also the serious results of extension of the disease to the ureters and pelves of the kidneys. Fortunately, the female urethra is short, and permits the use of a glass catheter, which can be kept clean. The instrument should be scalded before and after being used, and should be kept in a five per cent. solution of carbolic acid during the intervals. It should be free from cutting edges.

The labia should be separated to expose the urethral orifice, when the vestibule should be sponged with a solution of boric acid or sterile water. The catheter should be gently introduced. Should the urethra become painful or irritation of the bladder occur from frequent use of the catheter, the bladder should be irrigated with a hot boric acid solution. After an abdominal operation the catheter need not be used for twelve hours, unless the patient experiences much distress.

146. Comfort of Patient.—Immediately after the operation the patient is placed in bed, covered warmly, protected from draft, and kept quiet; the room should be darkened. If

the operation has been protracted or the patient is depressed, hot-water bottles should be placed about her to maintain the body-heat. These bottles should be tightly corked and a blanket should be placed between them and the skin. The patient, unable to understand or to make known her discomfort, may be badly burned if such precautions are not exercised. As she recovers, it becomes very irksome to remain in one position. An attentive nurse can greatly add to her comfort by passing her hands under the patient so that cool air reaches the heated back, by changing her from one side of the bed to the other, and by keeping the clothing under her smooth and dry. Unless there is some especial contraindication, as the presence of a drainage-tube, she may be turned upon her side. The nurse can accomplish this in part and can give great comfort to the patient by raising the mattress and slipping pillows under it, thus resting the back. One of the earliest symptoms of which the patient complains is intolerable thirst. It is better to limit the quantity of liquid for the first few hours to small quantities of hot water—a half ounce every hour, given with a horn spoon, as the china cup would burn the lips. Ice should not be given; it increases the thirst and the patient will not be content without a piece constantly in her mouth. Both mouth and stomach soon become irritated. When the patient does well, she can have a cup of tea or coffee on the morning following the operation, small quantities of ice-water or soda-water, a teaspoonful of beef-juice every three hours; and on the second day light food, and by the end of the week a generous diet.

147. Vomiting should be an indication to discontinue everything by the mouth. Enemas of warm water, six to eight ounces, may be given to assuage thirst, and when the patient is in need of nourishment, nutrient enemas may be given every three or four hours. Nausea and vomiting occur very frequently after an operation and may continue several days. The ejected material may be the fluid which has been ingested, or bile, mucus, or the contents of the small intestine. The application of a mustard plaster and an enema of 30 grains of chloral and 1 dram of potassium bromid in 2 ounces of warm water will often be sufficient to quiet the irritability. If the patient is constantly retching, it is better to give a large draft of water with 1 dram of bicarbonate of soda, a cup of weak tea, or some soda-water.

Professor Hare has suggested 2 grains of acetanilid and ½ of a grain of caffein citrate, to be repeated in two hours. I have found this formula of advantage in vomiting following etherization. Other remedies of more or less value are: cocain

(4 per cent. solution) 3 drops every hour; tincture of nux vomica, 2 drops every hour; 2 drops of compound tincture of iodin and $\frac{1}{8}$ of a grain of carbolic acid every hour; or 1 drop of Fowler's solution every half hour. The earlier the bowels can be evacuated, the sooner will the offensive material be removed; hence, the most effective treatment will be the administration of a saline, or, when it can not be retained, the use of calomel, alone or in combination with bicarbonate of soda, 5 grains of the latter to from $\frac{1}{2}$ to 1 grain of the former, every hour until evacuation of the bowels occurs or until eight doses have been taken. In frequent vomiting a Seidlitz powder is very efficient. If vomited, it generally empties the stomach, and when retained, starts the current through the canal.

If the intestine is distended and has not yielded to enemas or to the purgatives suggested, and the patient is constantly vomiting small quantities of dark fluid, nothing will give quicker or more lasting relief than irrigation of the stomach through a stomach-tube. When it is evident that the vomiting is an indication of peritonitis, it is wiser to discontinue purgatives and be content with lavage. No food, not even water, should be given by the mouth, and peristalsis should be arrested by small doses of morphin hypodermically. Rectal feeding may be required because of irritable stomach and the enfeebled condition of the patient, and especially in conjunction with the treatment suggested for peritonitis.

Peptonized milk or broth may be given every three or four hours. When the patient is much depressed, a normal salt solution and whisky or bovinin in combination may be given. When rectal feeding is practised, the bowel should be irrigated once or twice daily.

148. Tympanites may be the result of a passive collection of gas in the intestines, or may indicate the development of peritonitis. The early passage of flatus is always an encouraging symptom. The sensation of distention may be promptly met by the use of an enema of—

Magnesia sulph., Glycerin, Water,	.....	āā ℥j.

If relief is not secured, an enema of two tablespoonfuls of turpentine beaten up with the yolks of two eggs and strained into a quart of soapsuds should be administered. Keith recommends an enema consisting of six grains of quinin dissolved in four drams of whisky and two ounces of warm water, to be given every two hours until three doses have been administered. This prescription stimulates the nerve-centers and favors peris-

talsis. The most effective agent to influence increased peristalsis is an enema consisting of an ounce of powdered alum dissolved in a quart of hot water. If peristaltic action is marked, but reversed, lavage should be employed, a hypodermic injection of morphin given, and followed, after a rest of three or four hours, by a repetition of the quinin.

149. Shock.—Severe shock should be combated by the use of artificial heat, enemata of coffee and stimulants, suppositories of ice, elevation of the foot of the bed, bandaging the limbs, and the injection of normal salt solution into the buttocks, beneath the scapula, or directly into a vein. Hypodermic injections of strychnin (gr. $\frac{1}{30}$–$\frac{1}{6}$) should be given according to the urgency of the condition; when the shock is profound, the patient may be supported by the hypodermic administration of testicular fluid in twenty-minim doses three or four times daily. Digitalin (gr. $\frac{1}{10}$–$\frac{1}{4}$) may be given every eight hours, atropin (gr. $\frac{1}{100}$) twice daily, or (1 : 1000) solution adrenalin chlorid gtt. x–xx every two hours.

150. Anodynes.—The patient should be encouraged to bear the pain without an anodyne. When the pain is very severe, it may be allayed by the rectal use of chloral, 30 grains in two ounces of warm water.

When the patient is very much distressed, it may become a choice between the two evils—morphin or restlessness; and a hypodermic injection of from $\frac{1}{8}$ to $\frac{1}{4}$ of a grain should be given. Morphin decreases peristalsis and favors tympanites, and consequently should, if possible, be avoided.

151. Internal hemorrhage, if the technic is perfect, should not occur. Its existence will be indicated by paleness of lips, feeble or absent pulse, sighing respiration, and clammy perspiration. The use of strychnin or the injection of salt solution favors the increase of hemorrhage. The only proper treatment is the prompt reopening of the wound and the ligation of the bleeding vessel.

152. Removal of Sutures.—The sutures in an ordinary case should be removed about the seventh or eighth to the tenth day. If the patient has had a complicated convalescence, the union will not be so firm, and it would be better not to remove them until the end of two weeks. If the sutures are pulling and causing pain, a part of them may be removed. The same care regarding cleanliness and avoidance of sources of infection should be practised as in the operation. The sutures introduced as suggested by Haughey need not be removed for ten days or two weeks. The suture is drawn up for an inch at one end, cut, and the remaining portion withdrawn. The middle suture, unless carefully placed, will sometimes be difficult of removal.

A few days' delay will generally facilitate its removal, or it may be secured to a piece of elastic, which will make continuous traction. Leaving the sutures long (see Fig. 79) will facilitate their removal and dispense with the necessity for forceps to lift up the knot. The wound should be dressed as in the beginning.

153. When Permitted to Get Up.—The patient should not be permitted to sit up in bed prior to the sixteenth or eighteenth day, and then only for a few minutes, resting upon a bed-rest. The time may be increased each day, and she can be lifted out upon a chair at the end of the third week.

154. Plastic Operations.—In plastic operations the same precautions in cleanliness must be observed. Sponging can be replaced by the use of continuous irrigation. The parts may be dusted with acetanilid or iodoform and boric acid. · The parts should be dressed with sterilized gauze held in place by a bandage.

Vaginal irrigation should not be practised during the first forty-eight hours subsequent to an operation, for it interferes with the sealing of the wound by plasma. The patient should be confined to bed at least two weeks, and in perineal operations three weeks are preferable. In combined uterine, vaginal, and perineal operations the internal sutures, if nonabsorbable, should remain for three or four weeks. I prefer chromic catgut for all plastic work, for the reason that the patient is spared the discomfort of the removal of sutures, and the newly united tissues are not subjected to the strain.

MEDICAL TREATMENT.

155. General Treatment.—In every case of genital disease it is very important that the various organs of the body should be carefully interrogated as to the performance of their functions. It is a hopeless task to attempt to treat the disease of one organ of the body as if it were not an integral part of the whole, and capable of producing reflex effects upon organs near or remote, or of being itself the seat of reflex conditions. Engorgement of the hepatic system and the consequent hemorrhoidal congestion must be corrected. This is effected by purgatives, laxatives, and alteratives. The patient should have calomel (gr. $\frac{1}{10}$) or podophyllin (gr. $\frac{1}{20}$) at night, followed the next morning by a Seidlitz powder, Rochelle or Epsom salts, phosphate of soda (℥ij), or a wine-glass of Hunyadi Janos or Friederichshall water. If the liver is particularly sluggish, frequent applications of hot water over the hepatic region should be made. Ammonium chlorid or potassium iodid internally may be of service.

Efficient action of the kidneys should be secured by the use of diuretics, or want of action should be compensated by increased action of the bowels and skin. As anemia is a frequent accompaniment, the administration of the reconstructives, such as quinin, strychnin, arsenic, mercury, the bitters, and, in proper subjects, when the system has been prepared, the use of iron.

Because of the profound effect this class of diseases exert upon the nervous system, the antispasmodics have found favor. In many cases the valerianate of zinc, asafetida, and the bromid salts will prove very grateful. In very nervous and anemic patients the cold pack, followed by massage, will be exceedingly beneficial. The state of the stomach, the heart's action, and the character of the respiration should always receive consideration.

156. Specific Remedies.—The remedies which may be considered as specifically uterine in their action are ergot, hamamelis, hydrastis canadensis, and viburnum prunifolium.

Ergot is generally given in hemorrhage. It acts in two ways: (1) By stimulating the nonstriated muscle-fiber of the blood-vessels, increasing the rapidity of the circulation; (2) its direct action upon the uterine muscle, by which compression is made upon the vessels and a mass within the uterus is gradually extruded.

A satisfactory prescription is—

℞. Ext. ergot., ... f℥j
Ext. hamamelis, } ..... āā f℥ss. M.
Tr. cinnamomi, }
Sig.—f℥j every two or three hours.

This combination is generally more effective than the ergot used alone. If the contractions are painful, one or two drops of the fluid extract of cannabis indica will be of benefit.

Hamamelis and hydrastis undoubtedly owe their action to the large amount of tannic acid they contain. Hydrastin or hydrastinin, in doses of from $\frac{1}{8}$ to $\frac{1}{4}$ of a grain, is more effectual in controlling hemorrhage than the fluid extracts.

Viburnum prunifolium has been greatly vaunted as a remedy for the relief of dysmenorrhea or the arrest of threatened abortion, but I have never been able to obtain any perceptible value from its use.

The extract of thyroid gland seems to exercise a specific influence upon the uterine mucous surface. In women who are very obese and have associated with the condition amenorrhea, or very scanty flow and sterility, the administration of the thyroid extract, in addition to the reduction of flesh, increases the flow, and frequently appears to overcome the sterility. The late Dr. E. H. Coover, of Harrisburg, found thyroid extract very effective in allaying the pain of advanced carcinoma of the

uterus. He also thought that it had an influence in delaying the progress of the disease. This opinion seems in harmony with the observations of Beatson and others in carcinoma of the mammary gland.

Thyroid extract is frequently of value in producing an improvement in the conditions which occasion uterine hemorrhage, whether these be from interstitial endometritis, submucous fibroma, or carcinoma. Marked changes in the nutrition and the reduction in the size of myomata have been claimed for the use of this drug.

Adrenalin, or extract of the suprarenal gland, through its action upon the involuntary muscular fiber, exerts a decided influence upon the uterine circulation. It is consequently a valuable addition to our armamentarium for the control of hemorrhage.

Apiol, and the manganese salts, cause a hyperemia of the uterine mucous membrane, as indicated by increased normal menstrual flow, and its return in amenorrhea.

157. Rest and Exercise.—It is very difficult to fix definite rules to guide a patient as to the amount of either rest or exercise she should take. What one person may regard as a pastime, another will consider violent exercise. Women with inflammatory or engorged uteri are benefited by certain hours of rest each day. The recumbent position permits the blood-vessels to secure relief. Not infrequently, relief is enhanced by elevating the foot of the bed or by resting the pelvis upon a firm pillow. In predisposition to hemorrhage from fibroid growths, the patient should be kept in bed for a few days prior to, and during the menstrual period. Rest is obligatory in all acute inflammatory troubles. Some patients will, however, have to be stimulated to take exercise; they are disposed to go to bed on the slightest provocation, and remain so long that their muscles become flabby and the vessels grow feeble; the patient becomes bedridden, and every effort of exertion is attended with real or imagined pain. Such patients may require resort to massage and electricity to enable them to resume their ordinary duties.

Judicious use of the bicycle or encouragement to play golf will be found most valuable auxiliaries in nervous patients who are dominated by imaginary aches and pains. The increased oxygenation and elimination without doubt free the patient from the cause of her distress.

LOCAL THERAPEUTICS.

158. Baths.—The sitz-bath of hot water in inflammatory and congestive conditions is capable of giving great comfort. This should be followed by rest, and it would be contraindicated where there was a tendency to hemorrhage or in a possible pregnancy. In neurotic patients, a systematic course of hydrotherapy will frequently prove restorative when all other means have proved futile.

159. Douche.—The value of the hot douche was made known by Emmet. It should be given with a gravity syringe while the patient is in a recumbent position; the more prolonged, the larger the quantity, and the higher the temperature (115° to 120° F.), the more enduring will be the effect. The ordinary fountain syringe, a large vessel with a tube leading from its lower end, or an ordinary pitcher with a rubber tube carried to and held at its bottom by a weight, may be used. Instead of the ordinary rubber, wooden, or metal nozle, a glass end-piece is preferable, as it can be more readily cleansed. When preferred, the water may be medicated with astringents, such as alum, sulphate of zinc, acetate of lead, hydrastis, or hamamelis; or with antiseptics, as boric acid, carbolic acid (two to five per cent.), or permanganate of potash (one to two per cent.). The difficulty of saving the clothing from staining renders the use of the latter agent less frequent. Creolin (one to four per cent.) and acid sublimate (1: 5000 to 1: 2000) are valuable. The antiseptic injections are of especial value in vaginal discharge, more particularly when of a specific character.

The advent of menstruation is considered as contraindicating irrigation, but it may be resumed before it ceases, particularly when the odor is offensive or the parts are irritated, using plain water, at a temperature of 100° F. If the vaginal discharge is particularly offensive, as in malignant disease, a douche, of thymol solution, one or two per cent., is a most excellent deodorizer.

Astringent douches are used in excessive vaginal secretion, but should not be used when the patient is wearing a pessary, as the salts are deposited upon the instrument, roughen its surface, and thus increase the irritation.

Rectal douches may be employed to cleanse the bowel, and for the relief of inflammation of the rectal mucous membrane or for their effect upon the neighboring pelvic organs. The close proximity to the uterus and broad ligaments, and the ability to retain the fluid longer in contact, make the use of the rectal enemata of hot water of especial value. Medicated

enemata are used to unload fecal accumulations for the relief of tympanites, and to medicate local inflammations.

Vesical douches are used for the relief of inflammatory disease of the bladder and urethra.

160. External Applications.—In acute inflammatory conditions the popular plan of treatment is to employ hot applications, but we have in the ice-bag a far more efficient means of allaying pain and of limiting the area of inflammation. Its persistent application will in many cases secure resolution in what would otherwise prove a serious disorder. The ice-bag over the sacrum affords prompt relief of dysmenorrhea of the congestive form.

161. Counterirritants are productive of benefit in the more chronic forms of disease. Painting the skin over the lower abdomen with tincture of iodin is more frequently resorted to. It may be repeated and continued so long as the skin will bear it. The irritation is increased by the addition of croton oil.

℞. Ol. tiglii, ... f℥j
Tr. iodin., ... f℥ij
Etheris, ... f℥v. M.
Sig.—Apply with brush externally.

It produces a crop of pustules, which should be allowed to dry before the application is repeated.

The most effective procedure is the application of a blister over the seat of pain or to the inflammatory exudate two or three times a month, but this should not be practised when the patients are much depressed or very anemic.

Fig. 80.—Butt Uterine Scarifier.

162. Bloodletting.—The general abstraction of blood is now rarely practised. Doubtless there are many cases in which a good bleeding would cut short a severe illness or abort an inflammatory attack. The local abstraction of blood by the use of a scarifier or by puncturing the cervix will often prove effective in relieving the pain of engorgement and in promoting absorption and resolution of inflammatory conditions.

163. Local Applications.—A few years ago the routine treatment was the introduction of solid silver nitrate into the uterine cavity, the use of fuming nitric acid, and other powerful caustics. Such treatment cured by destroying the glandular tissue of the part. Milder measures are now practised.

It should be an accepted rule that no intra-uterine medication should be practised unless the uterine canal is freely open to permit of thorough drainage.

Applications to the uterine cavity are made by wrapping a probe or applicator with absorbent cotton, which, after being saturated with the medicinal agent, is carried into the canal.

Fig. 81.—Aluminium Uterine Applicator.

A few drops of the medicinal agent may be introduced by the long pipet. In the use of either procedure it is desirable that the cervix shall be freely opened, and the uterus in good position. If not, the medication will produce uterine contractions which will result in violent colic. Such attacks not infrequently are followed by severe inflammation of the adnexa and even of the peritoneum. To render intra-uterine treatment of value

Fig. 82.—Long Glass Pipet.

the plug of thick mucus which generally fills up the diseased cervix must first be removed, in order to permit the contact of the medicinal agent with the affected surfaces.

164. Various Agents.—The agents generally applied locally may be classified as antiseptic, astringent, and caustic. The antiseptic applications are the combination of carbolic acid, creasote, iodin, and iodoform. Useful preparations are:

℞. Acid. carbolic., ... ℥ss
Tr. iodini, ... f℥j. M.

℞. Creasoti, }
Glycerin., } ..... āā f℥ss.
Alcohol., } M.

An astringent effect can be secured by a combination of tannin, as:

℞. Acid. tannic., ... ℥j
Tr. iodini, }
Glycerin., } ..... āā f℥j. M.

The most frequent applications are the tincture of iodin and Churchill's tincture.

Iodoform may be used in the form of crayons, as an ointment, or as a powder, with the insufflator. The various astringents may be applied in powder alone or in combination with boric acid, iodoform, or acetanilid.

165. Astringents.—The most available astringents are alum, borax, sulphate of copper and sulphate of zinc, the tincture of the chlorid of iron, fluid extract of hydrastis, and fluid

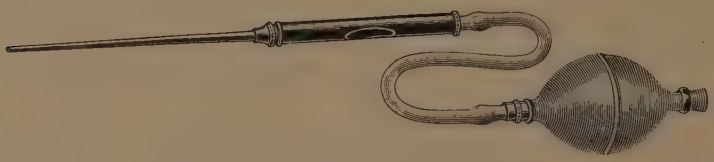


Fig. 83.—Insufflator—Straight Stem.

extract of hamamelis. The solid substances are best used in mild solution. Some of these agents when used without dilution are strongly caustic.

166. Caustics.—Crayons of sulphate of zinc (fifty per cent.) are very effective for caustic purposes, and are used in aggravated forms of endometritis. Still more effective is the chlorid of zinc in crayons (thirty-three per cent.).

Liquid caustics are nitric acid, acid nitrate of mercury, sulphuric acid, hydrochloric acid, chromic acid, solution of zinc chlorid, solution of silver nitrate, tincture of iron chlorid, carbolic acid, and creasote. It is exceedingly infrequent that the more active caustic agents are required.

167. Tampons made of absorbent cotton, lamb's wool, or gauze afford an efficient method of treating the cervix. The best tampon is composed of a combination of gauze and cotton or lamb's wool. It should have a thread attached, by which it can be withdrawn. The tampon may consist of simple sterilized material or may be medicated with antiseptics, astringents, styptics, anodynes, or alteratives. The principal purpose of the tampon is to sustain the uterus at a higher level, which relieves the patient from the dragging pains due to want of support of a heavy organ, and the change of position improves the circulation; the addition of an antiseptic permits it to be retained for a longer period without becoming foul. Sublimate, from its tendency to irritate the vagina and vulva,

Fig. 84.—Tampon.

can not be satisfactorily used. Carbolic acid, boric acid, and iodoform are most satisfactory. The addition of glycerin is of value. By its affinity for the watery portions of the blood it produces a profuse discharge, which depletes the vessels and favors the absorption of exudates. The boroglycerid, glycerite of tannin, and a ten to twenty per cent. solution of ichthyol are popular applications upon the tampon, but the patient should be cautioned, in the use of the two latter, to wear a napkin in order to prevent her clothing from being stained.

Besides supporting the uterus, the tampon may be used to control hemorrhage or discharge; to complete the diagnosis, through the discharge which it induces; to assist in maintaining the uterus in a normal position; and to prepare the way for the use of a pessary.

168. Massage.—General massage affords an effective means of promoting nutrition and of improving the condition of patients suffering from chronic pelvic troubles. It increases the number and the activity of the red blood-corpuscles, carries oxygen to the remote tissues and organs, facilitates oxgenation and combustion, and favors absorption, but, best of all, it improves the nerve tonus. Many patients are incapacitated by illness, by aggravated pains, or by disinclination to take exercise. Judiciously regulated massage accomplishes the constitutional changes ordinarily effected by exercise, free from its possible deleterious influences. Slowly the individual is rehabilitated, and as she gradually and insensibly resumes her self-control, she is emancipated from the pre-existing unfortunate nerve phenomena.

169. Pelvic Massage.—The beneficial results of massage in local inflammations of joints and superficial portions of the body justified the hope that it might be practised with advantage in the conditions of acute and chronic exudations within the pelvis. It has been systematized into a recognized procedure, known as pelvic massage, largely through the study and experiments of Thure-Brandt, a Swedish masseur.

It is practised by having the patient lie upon her back upon a couch or table, with her buttocks close to its edge; the limbs are flexed upon the body. One or two fingers of the left hand are introduced into the vagina, with which the uterus is gently pushed forward against the anterior abdominal wall. The fingers of the right hand are placed upon the abdomen, and are moved in a circulatory or rotatory manner over the surface, or, rather, moving the surface with them in this manner (Fig. 85). The greatest gentleness must be exercised in the beginning, increasing the pressure as the patient becomes reassured or as the pain is lessened. As we progress, the fin-

gers may be made to dip down, to push off and separate adherent organs, and to follow lines of cleavage indicating inflammatory adhesions. The seances vary in length from five to fifteen minutes, the shorter time being preferable in the earlier applications, and they should be repeated from three times weekly to once daily. The exercise of this procedure will be found to produce a rapid alteration in inflammatory

Fig. 85.—Position of the Fingers in Pelvic Massage

accumulations, setting free the uterus and its adjacent organs. The procedure will be indicated in all subacute and chronic inflammations of the pelvic organs unassociated with pus formation; in displacements, when fixed by inflammatory adhesions; in subinvolution and hypertrophy of the uterus from chronic interstitial inflammation; and in relaxation of the pelvic floor induced by increased weight of the pelvic organs.

It is contraindicated in the presence of pus formation, whether contained in the tubes or within the pelvic tissues.

Massage is rendered difficult by thick abdominal walls, and in nervous, hysteric women. In the latter, however, much may be done by gentle procedure until the patient's confidence and coöperation are secured.

ELECTRICITY.

170. Forms.—The immense influence exerted by the use of electricity in the development of the arts and sciences naturally has led to its study and utilization in the treatment of disease. The various electric currents were early employed in an empiric way in gynecology. It remained for Apostoli, however, to formulate plans for their more accurate dosage and systematic use. The principal forms in which the electric current is generated and applied are Franklinic, galvanic, faradic, sinusoidal, and Röntgenic.

171. Franklinism.—Franklinism, or the static current, is the employment of electricity generated by friction. It is not generally used, but is an excellent nerve stimulant and counterirritant; from the use of which great benefit has been claimed in cases of hysteria and neurasthenia. It has afforded the greatest service to patients in whom the local pelvic lesions are slight or difficult to recognize, while the element of pain is a marked factor. It has been employed with advantage in amenorrhea, dysmenorrhea, ovarian, lumbar, or lumboabdominal neuralgia, vaginismus, hyperesthesia, and various neurasthenic conditions. The seances may be continued from six to thirty minutes. The number of applications is indefinite.

172. Galvanism.—The galvanic current has an extensive field for its application in the treatment of diseases of the pelvic organs. As a therapeutic agent its effects are recognized as polar, interpolar, and general (Martin). The polar effects are acid and alkaline at the respective poles. In very strong currents the action becomes caustic. The positive pole is a powerful sedative to the sensory nerves, and acts as a vasoconstrictor of the blood-vessels in its vicinity. As a result of the accumulation of certain salts from the metal electrode employed, it proves destructive to germs. The negative pole with current of proper density causes liquefaction of the tissues, and if the current is very strong, it exerts an alkaline caustic action. It is a powerful irritant to the sensory nerves of the parts, and also acts as a vigorous vasodilator of the blood-vessels. Interpolar action consists of electrolysis and cataphoresis, or transfers

all fluids in bulk from the positive to the negative pole. Galvanism in its general effect, when forced through a portion of the body acts as a tonic to the entire system. The beneficial influence of the agent in gynecology is most effectively displayed in the treatment of chronic endometritis, pelvic inflammatory exudates, and in some varieties of fibroid tumors.

173. Apparatus for Application.—The investigations of Apostoli demonstrated that the application of high powers

Fig. 86.—Portable Galvanic Battery with Galvanometer.

of electricity resulted in the destruction of tissue in which acid materials were found about the positive pole, while alkalies collected at the negative. The former caused a dry, brownish eschar; the latter, a soft, watery, elastic slough, which did not contract. The resistance of the skin required for the use of high powers a large, inactive electrode externally. Apostoli devised and employed a moist clay pad. Other operators have used a bladder or other animal membrane filled with

a salt solution, or a large metal disc covered with wet cotton or a towel for the external electrode. The internal electrode may be vaginal or intra-uterine. The former may consist of a knob or a nest of knobs, from which a suitable one can be selected and attached to a gutta-percha-covered metal rod. The intra-uterine electrode may consist of a platinum wire or a steel rod insulated to within one or two inches of its end. The insulating sheath of gutta-percha or celluloid may be movable and thus permit a variable surface to be subjected to the application.

A battery, either portable or stabile, will be required cap-

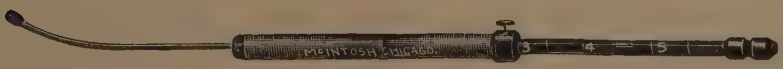


Fig. 87.—Intra-uterine Electrode with Movable Insulating Cover.

able of generating a current of from 200 to 400 milliamperes, and so arranged that the strength of the current can be gradually increased. It should be provided with a galvanometer or a milliamperemeter to measure the current; a rheostat, by which the strength of the current can be governed; a commutator, to permit a change of poles without removal of the electrodes (as a reversal of the poles can not be made without shock, the precaution should be exercised to greatly reduce the intensity of the current before such a change is made).

174. Method of Procedure.—Apostoli's employment of the electric current requires a careful examination and an accurate

Fig. 88.—Vaginal Electrodes of Different Sizes.

diagnosis. If a growth, careful measurement from various fixed points should be made in order to be able to determine the results of treatment. The hands, genitalia, and electrodes must be thoroughly cleansed or disinfected.

Before the external electrode is applied the skin should be carefully examined and all broken places covered with collodion or plaster; otherwise the electrode will be unendurable.

The internal electrode should be introduced without the speculum. The patient should be apprised that there will be a slight burning, and that there may be a bloody discharge

subsequently. Her clothing should be loosened, her corsets removed, and the bladder and lower bowel emptied. The application should not follow a full meal.

While the electrodes are being introduced the current should be closed, and gradually opened subsequently. The first application should be carefully made with the purpose to determine the patient's sensibility. The pole used for the active or intra-uterine electrode must depend somewhat upon the existing conditions. The positive pole possessing the most electrolytic action, and being an effective hemostat, should be employed for hemorrhage. The negative pole acts like an alkali, is the most painful, and is used to decrease the size of a growth or to enlarge a stenosed canal. The duration of the applications may vary from three to ten minutes. The number of applications for an individual case is difficult to fix—generally from twenty to thirty. Their frequency is dependent upon the condition, varying from every eighth day to two or three times weekly.

175. Indications.—The employment of galvanism is advocated in amenorrhea, dysmenorrhea, and menorrhagia; in chronic inflammation dissociated with suppuration; for the arrest of hemorrhage, relief of pain, and decrease of size in myomatous growths of the uterus, particularly in the submucous and interstitial varieties; and for chronic ovarian inflammation. This agent seems particularly valuable in women suffering from bleeding fibroids near the menopause, in whom the conditions render a radical operation unjustifiable.

176. Contraindications.—According to Apostoli, the galvanic current is contraindicated in the following conditions: (1) Hysteria; (2) intestinal catarrh; (3) pregnancy; (4) malignant degeneration of a tumor; (5) fibrocystic tumors; (6) suppurative inflammation of the adnexa. To these Schaeffer would add any acute or subacute inflammation of the pelvic viscera, a very hard or fully matured tumor, an excessively large growth, a submucous growth which is pedunculated, enfeebled heart action, and acute nephritis.

177. Faradic.—The current of induction has a primary and a secondary current. One pole may be applied in the vagina or the uterus; the other, over the abdomen. Apostoli advised a bipolar electrode in which the negative and positive poles were placed in the same electrode, with a band of non-conducting material between them. In this way the current of electricity was limited to a greater extent to the tissues desired to be affected. This method of procedure was less painful. The primary current is one of quantity; the secondary one of tension. The latter is dependent upon the length and fineness

of the wire. The current of tension is effective in subduing pain, such as ovaralgia, abdominal pain in hysteric women, vaginismus, and pain from pelvic inflammation. It proves to be an emmenagog. It may be applied three times weekly, or even daily, each sitting lasting from ten to thirty minutes. The electrode is first introduced; the current is then opened slowly, and gradually closed before the electrode is removed. This is necessary in order to prevent severe pain.

178. Sinusoidal.—Apostoli employed a current introduced by d'Arsonval, known as the sinusoidal. The patient is placed upon an insulated couch beneath which is a large coil of wire through which a current of 450 milliamperes is passed. The

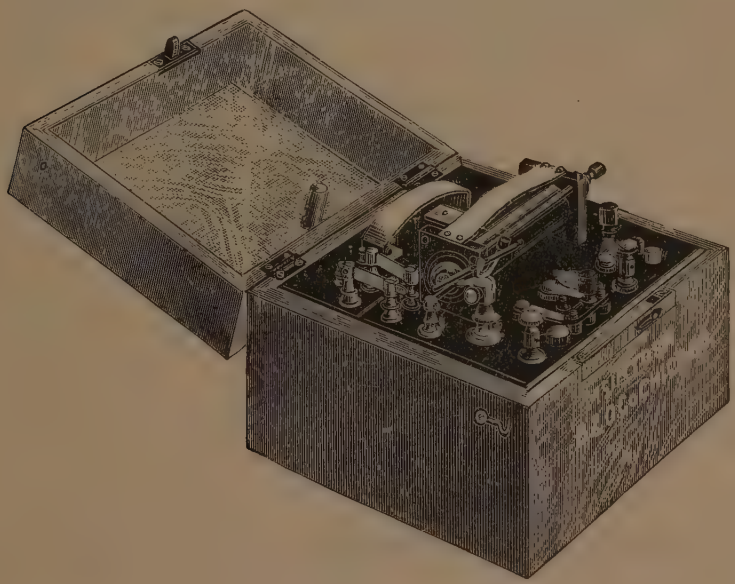


Fig. 89.—Faradic Battery.

patient is enveloped in an electric atmosphere in which the effects will depend upon the number of alternations in a second, the degree of electromotor force, and the quantity of current. It acts more particularly upon the muscular structures without the occurrence of pain or disagreeable sensation. Its employment modifies nutrition by an increased absorption of oxygen and the greater elimination of carbonic acid. The current exerts a marked analgesic effect, which frequently induces the disappearance of painful symptoms. It is consequently of benefit in dysmenorrhea, but has displayed its beneficial effects to the greatest extent in the treatment of peri-uterine

inflammations and pelvic exudates, in the resorption of which it is one of the most effective means at our disposal.

179. Röntgenic.—This term is applied to peculiar rays of light which are engendered by light under electric excitement, being transmitted through tubes of very high vacuum. The discoverer of this phenomenon, Professor Röntgen, of Wurzburg, designated these rays as the *x*-rays. The influence of the discovery of a procedure capable of transillumination of the structures of the body can hardly be estimated. The *x*-rays have proved both diagnostic and therapeutic. They

Fig. 90.—Bipolar Uterine Electrode.
+. Positive pole. —. Negative pole.

can be generated through the employment of the static machine; the induction coil, batteries, and the electric-lighting main. The essential portions of the apparatus are the vacuum tube and fluorescent screen. The latter consists of a lightly constructed tight box, somewhat similar in shape to the stereoscope. The small end has an aperture which is made to fit tightly over the eyes and bridge of the nose. The inner surface of the broad end is covered with a uniform layer of fine crystals of a fluorescent material, generally barium platinocyanid, or calcium tungstate. Not only is the operator able

Fig. 91.—Vaginal Electrode—Bipolar.

to inspect the internal structures of the body, but he is also able to record what he sees upon a sensitive photographic plate for the benefit of others.

The employment of the procedure has afforded information of value in the diagnosis of obscure cases, notably in pregnancy and ectopic gestation. The beneficial influence of the rays in the treatment of superficial malignant and tubercular conditions suggests the hope that it may be equally effective in arresting the ravages of these disorders when they involve the deeper structures. The rays are found to exert a more

destructive action upon the less resisting malignant cells than upon the healthy tissues. If subsequent investigation shall demonstrate the correctness of this view, which now seems probable, the operator who does not follow his radical operation with the employment of the Röntgen rays to destroy infectious germ-cells which have possibly lodged in the neighboring lymphatic spaces and vessels will fail of doing full justice to the interests of his patient. In carcinoma of the cervix the depth of the tissues involved from the surface renders the application more difficult, and requires special care to protect the superficial structures from burns which would delay and arrest the necessary treatment.

Protection from this undesirable result is best afforded by moulding to the surface a sheet of blotting-paper, covered with four layers of tinfoil. The shield should extend some five centimeters in each direction. For treatment of uterine cancer a lead-lined rubber speculum may be employed to expose the surface. Painful symptoms and obscure neuralgias are frequently greatly benefited when the painful part is subjected to the *x*-rays. This fact seems of portentous significance in the field of gynecology.

180. Finsen Light.—The Finsen light consists of the ultra-violet rays, which are invisible to our vision and are capable of refraction and concentration. They exist largely in sunlight, but may be artificially produced from the arc light. Glass is a non-conductor to these rays, therefore it is necessary to construct a plate or disc of quartz, or, still better, of transparent rock salt. The Finsen light differs from the Röntgen rays in being very destructive to bacterial life, while the latter rather, if it has any effect, facilitates bacterial growth. The application of the Finsen light must, under present conditions, have a limited application in gynecology, because it causes an anemia of the tissues upon which it is purposed to exert its influence.

181. Electrocautery and Light.—The employment of electricity as a means for the production of heat for cautery purposes has won a well-recognized place through the work of Byrne with the galvanocautery and later its ingenious application by Skene and Downes to electrothermic hemostasis.

The power can be secured by batteries of large size, by storage cells, or, better, from the street main through a transformer. Dr. Downes has modified and improved the instruments devised by Skene. He applies a special form of angiotribe to the broad ligaments, which, when raised to a dull red heat, divides and cooks the tissues, thus rendering ligatures unnecessary.

The great advantage of this procedure is in hysterectomy for cancer of the uterus, as it enables the removal of a large amount of possibly infected tissue. The malignant cells which have been carried into the parametrium are supposedly less resistant to the effects of heat than healthy tissue. Therefore, it seems reasonable to infer that some of these are destroyed by the electrothermic measures which would otherwise survive to cause relapse if other methods of operating had been employed.

The same class of batteries enumerated for cautery purposes may also be employed for electric lights. The electric light is especially useful in inspecting the urethra, bladder, ureters, and rectum. The electric light in a cystoscope can be introduced through the urethra and the entire cavity of the bladder exposed, the orifices of the ureters recognized and any changes in the structure of the bladder are readily observed. The instrument may be employed to irrigate the bladder by closing its end; the bladder can be distended with air or gas, thus determining the capacity of the organ. Loss of structure, thickening, growths, and other changes in its walls are also perceived. It can also be employed for local medication and for catheterization of the ureters. The electric light can be employed to illuminate the rectum through long or short proctoscopes, the vagina by an attachment to a speculum, and even to look into the uterus, but as the latter canal has to be previously dilated, the instances are rare when its illumination will be of practical service.

EMBRYOLOGY AND ANATOMY OF THE GENITO-URINARY ORGANS OF THE WOMAN.

182. Development of the Genito-urinary Organs.—Some knowledge of the origin and processes of development of the organs is necessary to a proper understanding of the conditions in which they have failed to attain the normal. The embryonic period may be divided into five periods or stages.

The first period extends to the eighth week. Up to the fifth week from fecundation there is developed no sexual indication. The primordial kidney, the Wolffian body, the duct of Müller, and the Wolffian duct, from which the genital organs are to be developed, are found one upon each side of the median line. A cloaca is situated at the site of the future vulva, into which the urachus and intestine open. From the external surface of each Wolffian body a structure known as the genital gland develops, which subsequently becomes either the testicle or

ovary. Simultaneously, the cloaca is divided by a projection, the genital eminence or tubercle, which is marked by the genital furrow or groove. Their appearance at the eighth week affords no clue as to the probable sex.

The Second Period (Eighth to the Twelfth Week).—The Müllerian ducts coalesce, and the septum disappears in their lower two-thirds, while the insertion of the round ligament indicates the point of division between the tube and the uterus. The cloaca, by the development of the perineum, is divided into two portions—the urogenital sinus and the anus.

The third period (twelfth to twentieth week) witnesses the fusion of the uterine horns; the appearance of the arbor vitæ in the cavity of the uterus; the formation of the cervix; enlargement of the perineum; and development of the vagina, which opens into the urogenital sinus and forms the vestibule of the vagina, in which the hymen appears. The genital tubercle, which has been large, is reduced to the proportions of the clitoris, and the edges of the genital fissure become the nymphæ.

Fig. 92.—Human Embryo at End of Thirty-five Days.—(*Coste.*)

1. Tongue. 2. Aortic Bulb. 3. First permanent aortic arch. 4. Second aortic arch. 5. Third aortic arch, or ductus Botalli. 6. The two filaments to the right and left of this figure are the pulmonary arteries. 7. The trunk of the superior vena cava and the right azygos vein. 8. The common venous sinus of the heart. 9. Left auricle of the heart. 10. Right ventricle. 11. Left ventricle. 12. Lungs. 13. Stomach. 14. Left omphalo-mesenteric vein. 15. Wolffian body. 16. Right omphalo-mesenteric vein. 17. Intestine. 18, 18. Umbilical arteries. 19. Umbilical vein.

The fourth period extends from the twentieth week to the end of fetal life. During this period the fundus of the uterus

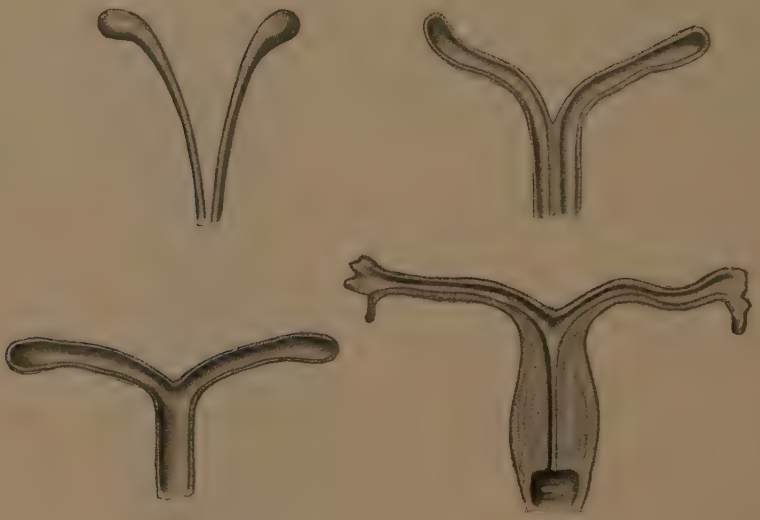
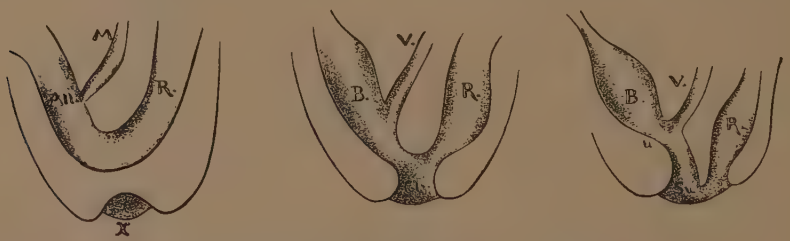


Fig. 93.—Coalescence of Müller's Duct.

increases in size; folds form in the vagina, as well as in the cervix, and the labia majora become fuller and more rounded.

The fifth period comprises the time from birth until puberty. The uterus increases in size and thickness; the uterine mucous



Progress of Development of the Genitalia.

Fig. 94.—All. Allantois. R. Rectum. M. Müller's duct. X. Indentation of the skin which forms the anus.—(*Schröder.*)

Fig. 95.—Cl. Cloaca. B. Bladder. R. Rectum. V. Vagina.—(*Schröder.*)

Fig. 96.—Su. Urogenital sinus. R. Rectum, separated from the former by the perineum. B. Bladder. V. Vagina. u. Urethra.—(*Schröder.*)

membrane, which up to the sixth year is folded like that of the cervix, becomes smooth. The vagina is elongated and the vulva is larger and more rounded.

183. Division of the Genitalia.—The special generative organs of the woman are situated in the pelvis in close association with the bladder and urethra, the rectum, and the anus. The female genitalia are divided into two classes: The external and internal organs, the former of which with the vagina form the organs of copulation, and the latter the reproductive organs proper.

184. The external genital organs are, enumerated from before backward, the mons veneris, the labia majora, the labia minora, the clitoris, the vestibule, perforated by the meatus urethræ externus, the orifice of the vagina, surrounded in the virgin by the hymen, the fourchet, the fossa navicularis, and the perineum, situated between the vulva and the anus. The external genitalia are also called the vulva, pudendum, or cunnus; the cleft between the labia majora is known as the rima pudendum.

185. The mons veneris is a cushion of fat situated over the pubes, covered with thick skin which is abundantly supplied with hair. The hair protects the vulva from the perspiration of the body. When the nude woman is erect, the mons veneris is the only portion of the genitalia visible.

186. The labia majora are skin folds which unite in front of the mons veneris. Posteriorly they thin off and terminate about one and one-half inches in front of the anus. Externally they are covered with short, crisp hair, which is continuous with that of the mons veneris. They are profusely supplied with sebaceous and sudoriferous glands. Their internal surfaces lie in contact and present a smooth, moist surface which resembles mucous membrane. The apposition of the labia majora, slightly separated by the labia minora and clitoris, forms the cleft of the vulva, the rima pudendum. Each labium contains a sac-like structure called the dartoid. This is analogous to a similar structure in the male scrotum. The round ligament, and in the fetus an open canal, called the canal of Nuck, terminates in this dartoid sac. Occasionally the latter remains open in the woman and permits the formation of a hydrocele. In fat subjects these folds contain a large quantity of adipose cellular tissue.

187. The labia minora are situated between the labia majora, slightly projecting beyond their level, and are much more prominent anteriorly. Upon wide separation they are seen to be continuous with the fourchet, and form the posterior commissure. Anteriorly they bifurcate and form two folds, an anterior, which passes in front of the clitoris and forms its prepuce or hood. The second passes behind the glans clitoris and forms the frenulum. The labia minora, also called the

nymphæ, have a smoother, but slightly roughened surface with free convex, sometimes notched, borders. Frequently small openings or perforations will be seen. The size of the nymphæ varies greatly, according to the age and race. They project considerably beyond the vulva in the young child, but, owing to the increase in size of the labia majora as puberty approaches, they are rendered less apparent. In the Bushwomen the

Fig. 97.—Virgin Vulva; Labia not Separated.—(*From Deaver.*)

labia minora frequently become so long that they reach to the knees, and are then spoken of as the Hottentot apron. The skin is covered with a stratified pavement epithelium, similar to that of the true epidermis. They are plentifully supplied with sebaceous glands, especially at the base of the folds, where they form a crowded layer upon the inner surface.

In the brunette the pigment deposit is frequently so great as to make them noticeably dark. The skin folds contain a small amount of connective tissue. During the act of coition the labia minora draw the glans clitoris against the male organ.

188. The clitoris, as in the male, is an erectile organ having its origin from the posterior surface of the ischiopubic rami, arising on either side as a crus clitoridis or corpus cavernosum. These unite to form one body in front of the symphysis. The organ is secured to the symphysis by the action of the sus-

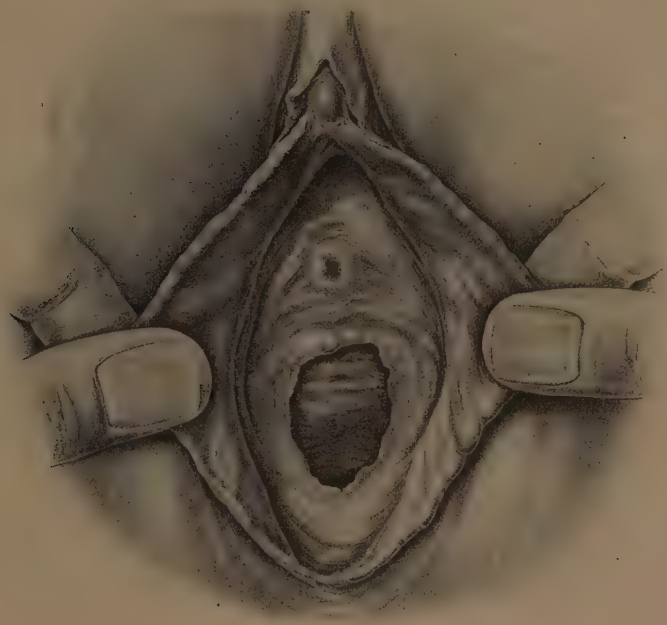


Fig. 98.—Virgin Vulva; Labia Separated, Showing the Hymen Unruptured. —(*From Deaver.*)

pensory ligament, and its circulation is influenced by the ischiocavernosus muscle, in which respect, therefore, it resembles the penis. The corpora cavernosa are enveloped by a fibrous investment and separated by a median septum of cavernous tissue composed of fine trabeculæ, in which the muscular elements predominate. The free extremity of the clitoris is situated at the anterior part of the vulva, about one-half inch behind the anterior extremities of the labia majora. The organ is surmounted by a median tubercle known as the glans clitoridis. The glans is more or less covered by the prepuce, which is formed

by the anterior folds of the labia minora or nymphæ. The glans is imperforate and is generally but slightly developed. When it appears enlarged the other parts of the vulva will generally be found small and ill developed.

189. The vestibule is, by some anatomists, described as the entire space between the labia minora, which, prior to the rupture of the hymen, includes its external surface; but as this portion largely disappears after successful coition, and completely after parturition, it seems better to confine this term to the portion ordinarily called by that name, which is the space bounded on each side by the labia minora, and posteriorly

Fig. 99.—Hymen Crescens.

Fig. 100.—Hymen Annularis.

by the anterior border of the vagina. This triangular space has the glans clitoridis at its apex. At its center near the posterior border is a rounded, pouting orifice—the meatus urethræ externus. The openings of the ducts of two clusters of large mucous follicles are also found in this situation. One of these groups lies immediately behind the clitoris, and when the ducts become occluded a cyst is formed. The other group is near the sides of the meatus. Mucus is secreted very freely by these follicles under any persistent local irritation. In the virgin a grooved ridge is found which, according to Pozzi, represents the corpus spongiosum of the male and is known

as the vestibular band. The orifice of the meatus urethræ is situated behind the clitoris in the posterior part of the vestibule and about one inch in front of the fourchet. It ordinarily presents a longitudinal or starred slit, the borders of which are slightly notched and projecting. Occasionally its mucous membrane bulges, forming a ring-like margin. Within the elevated margins of the meatus and slightly posterior to its center is found a minute opening, on each side, which usually is not easily detected in healthy subjects; but following gonorrhea

Fig. 101.—Hymen Serratus.

Fig. 102.—Hymen Infundibularis.

or leukorrhea they may be readily recognized. These openings are the orifices of Skene's ducts, which are parallel to the urethra and about two centimeters in length. They should be recognized, as they are sometimes so large that a catheter may enter one of the canals instead of the orifice of the urethra.

190. The hymen is a thin membrane acting as a sort of diaphragm between the internal genital parts on the one side, and the external parts and orifice of the urethra on the other, which is revealed by separation of the labia minora (Fig. 98). Its external surface resembles the structure of the latter, while the internal presents not infrequently the rugæ of the vagina. When the labia are not forcibly separated, the hymen appears as a vertical slit with its lateral edges in contact. With the

labia held apart, however, the opening is usually crescentic with its concave margin anterior (Fig. 99). Sometimes it is annular with a central opening (Fig. 100). The hymen may present a variety of forms and openings, such as the labial form, in which the lateral folds may be mistaken for the labia minora; the linguaformis, which presents a tongue-shaped projection posteriorly, and the falciform, which has a somewhat long and wide orifice. The free edge of the hymen may be smooth, denticulated, or serrated (Fig. 101). Its structure may be thick and fleshy, and present irregular folds resembling fimbriæ. The infundibular form (Fig. 102) presents a funnel-shaped appearance with the margins looking downward and

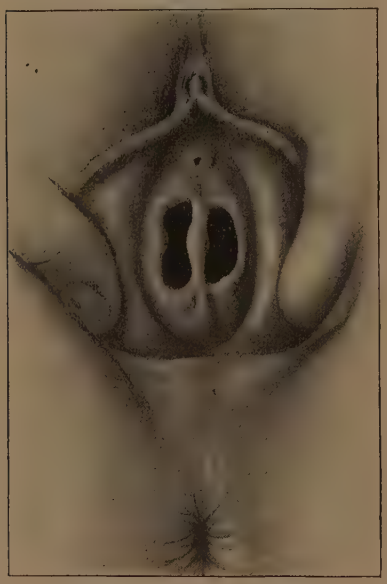


Fig. 103.—Hymen Biseptus.

Fig. 104.—Hymen Cribriformis.

backward. There may be two openings, the septus or biseptus (Fig. 103), or a number of openings, as the cribriform (Fig. 104). The membrane is usually thin and easily torn, but occasionally it is so firm that it withstands the most strenuous efforts at coition, and, therefore, will require incision before the sexual act can be accomplished. The hymen usually ruptures during the first coition, and occasionally its tear is followed by profuse and often dangerous bleeding (Fig. 105). The greater portion of the hymen is destroyed during the process of parturition, the remainder shrinking together to form small masses

at the vaginal outlet. These masses are known as the carunculæ myrtiformes. The number, form, and situation of these caruncles vary extremely. Generally there are three. One is situated at the posterior part, the others at the sides of the entrance to the vagina. Both surfaces of the hymen are covered with pavement epithelium. The hymen guards the entrance to the vagina.

191. The fourchet is a continuation backward of the labia minora in the form of a thin fold, and is rendered prominent by the separation of the vulva. Between this fold and the hymen is a boat-shaped depression called the fossa navicularis. Between the fourchet and the anal opening is an intervening space covered with integument some four centimeters in length, which is called the perineum.

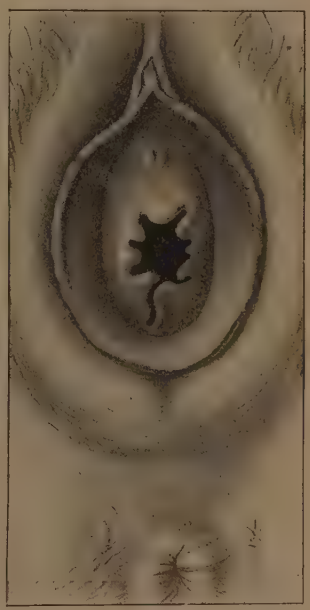


Fig. 105.—Laceration of the Hymen.

192. The muscles of the perineum are exposed by the removal of the skin, the superficial fascia, and a layer of the deep fascia. The muscles thus mapped out are: The *erector clitoridis;* the *bulbocavernosus* and the *transversus perinei*, paired muscles; and the *sphincter ani* and *levator ani*, which are single. The *erector clitoridis* arises from the anterior margin of the rami of the pubes and ischium and is inserted by two tendinous expansions, one above the junction of the crura into the body of the clitoris, and the other below and in front. The *bulbocavernosi* muscles arise from the tendinous raphæ and anterior aponeurosis of the perineum, and are separated by the vagina, around which they course, to be inserted by a thin slit into the crus of each side in front of the *erector clitoridis*. The outer fibers of the muscle wind inward beneath the erector muscle to reach the upper part of the bulb near its isthmus. A portion of the median fibers are apparently derived from the *sphincter* and pass upward to the clitoris, over the pubes, and are lost in the superficial fascia. Other fibers form a delicate muscular arch in front of the body of the clitoris. The action of the muscle is to compress the bulb of the vagina and to some degree act as a sphincter of the vagina, though Savage assigns the latter

function to a portion of the *levator ani*. The relation of a portion of the fibers to the *sphincter ani* produces a *figure-of-8 action upon the two orifices*, which it is important to remember in operations upon the sphincter. The *transversus perinei* muscles arise one on each side from the tuberosity of the ischium and are attached to the anterior aponeurosis of the perineal septum, the perineal body, and the skin of the perineum in front of the anus. The *sphincter ani* arises from the tip of the coccyx and is attached in front to the tendinous

Fig. 106.—Muscles of the Female Perineum.—(*Deaver.*)

raphæ of the perineum where it meets the fibers of the *bulbo-cavernosi*. Its fibers, closely attached to the skin, decussate in front of the anus, while some fibers appear to pass completely around it. The muscle is pierced by radiating fibers from the longitudinal muscular coat of the rectum and is in close relation with the *levator ani* and *internal sphincter*. This muscle forms the external sphincter and is voluntary in its action. The *levator ani* is the principal muscle of the pelvic

floor. It arises from the back of the body and horizontal ramus of the pubes, the pelvic fascia (white line), and the spine of the ischium. From its origin the muscle sweeps downward and inward and is attached in the middle line from before backward as follows: To the vagina, to the rectum, to its fellow of the opposite side, and, finally, to the tip of the coccyx. The pubic fibers blend with the posterior half of the upper border of the *sphincter vaginæ*. This muscle is more readily exposed from above.

The vulvovaginal gland with the bulb of the vestibule are exposed in the dissection already described. The former is a racemose gland, of which there is one situated on either side of the vagina and posterior to its orifice. It is analogous to Cowper's gland in the male. It is also known as the vulvar gland of Bartholin, or, according to Hugier, the vulvovaginal gland. It is about the size of an almond, but varies in different individuals and even upon the two sides. Occasionally glandular nodules are seen, which seem to be detached from the gland and scattered in the surrounding muscle. Within, the gland is in close relation with the vagina, to which it is adherent by tense cellular tissue, while externally it lies beneath the bulbocavernosus muscle. Its excretory duct, about one centimeter long, is directed from below upward and from without inward and opens in the angle between the hymen and the wall of the vulva. When the hymen has disappeared, its orifice is found in the corresponding angle between the carunculæ myrtiformes and the wall of the vulva. It is usually difficult to detect, but sometimes presents an orifice which will admit a probe. This gland furnishes the secretion which is manifest under the influence of sexual excitement or during coition. The bulb of the vestibule is a venous mass which is situated along each side of the vagina and the vestibule. It is related within to the vagina, vestibule, and urethra, and is covered externally by the bulbocavernosus muscle. The bulbs unite beneath the clitoris by a venous connection, the pars intermedia. Kobelt says the injected bulb is nearly four centimeters long, one centimeter wide, and from nine-tenths to one and one-tenth centimeters thick. Its external surface is convex, its internal surface concave. The bulb is a part of the erectile tissue of the female genital organs and is analogous to the corpus spongiosum in the male.

193. The perineal fascia or the fascia of the pelvic floor consists of the following:

1. The superficial fascia.
2. A deep layer of the superficial fascia.
3. The triangular ligament, composed of two layers.

The superficial fascia is a continuation of the general fascia of the body. It consists of two layers, an outer, more or less loaded with fat, which is continuous with the same layer over the buttocks, thighs, and abdomen. An inner, more resisting membranous investment descends from the abdomen, narrowed to the width of the pubes, but spreading out so as to envelope the anterior perineal triangle at its base—the perineal septum. The abdominal portion of the fascia is firmly adherent to Poupart's ligament; the perineal portion to the outer margin of the ischiopubic rami and the inferior margins of the septum, while the pubic portion is attached along a curved line of the bone, which indicates the origin of muscles of the anterior part of the thigh.

A tubular prolongation extends backward from the margin of the external inguinal ring on each side of the vagina, nearly to the posterior vulvar commissure, and is known as the pudendal sac. With its fellow of the opposite side, when enveloped with their cutaneous coverings, the two sacs form the labia majora. The pudendal sac contains more or less fatty tissue and the terminal fibers of the round ligament of the uterus are also lost in it. The sac may be the seat of hydrocele from a patulous canal of Nuck, or a hernia may develop by a descent of a section of gut or omentum through this canal. The injection of air into the sac gives a similar appearance to that induced by hernia. The fascia passes around the transverse perineal muscles to form the anterior layer of the triangular ligament. This union forms the ischioperineal ligament—a very firm aponeurotic band attached to the outer ends of the rami of the ischii in front of their tuberosities.

The *deep fascia*, or *triangular ligament*, has two layers—an anterior, or superficial, and a posterior, or deep. The superficial is attached to the rami of the pubes and ischium, and to the so-called transverse ligament of the pelvis, which lies immediately behind the subpubic ligament, from which it is separated by an opening for the dorsal vein of the clitoris.

Behind it is united with the superficial, as well as with the deep, layer of the pelvic fascia. The deep layer is also attached to the rami of the pubes and ischium, and joins the obturator fascia covering the lower portion of the anterior surface of the levator ani muscle. In front it is continuous with the vesicorectal fascia; and behind, with the dense anal fascia which covers the under surface of the levator ani muscle.

The junction of the three layers of fascia behind forms the ischioperineal ligament, which marks the boundary-line between the urogenital and anal regions.

The upper surface of the levator ani muscle is covered by a

fascia called the pelvic, which is a continuation of the iliac. The pelvic fascia is attached to the iliac portion of the iliopectineal line and to an oblique line upon the posterior surface of the pubic bone, from above and within the obturator foramen, to just below the symphysis. It covers the inner surfaces of the ilium and ischium about halfway down the pelvic wall until it reaches the so-called tendinous arch, which extends from the spine of the ischium to the pubic bone and below the obturator canal. This portion covers the obturator muscle, and is known as the obturator fascia. A thinner prolongation extends backward, and is known as the pyriform fascia.

The pelvic fascia splits into two layers at the tendinous arch—an upper, called the vesicorectal fascia, which extends over the levator ani muscle, and a lower layer, which follows the obturator internus muscle to the inner edge of the ischiopubic branches, and retains the name of obturator fascia. Below the insertion of the levator ani muscle is given off an investment, which is called the anal fascia. In conjunction with the portion of obturator fascia below the tendinous arch it serves as a lining for the ischiorectal fossa.

The vesicorectal fascia, from its insertion upon the pelvic wall, passes inward and downward and covers the upper surface of the levator ani to the base of the bladder, the vagina, and the rectum. In front, near the middle line, a thicker part of this fascia forms the anterior true ligaments of the bladder, or pubovesical ligaments.

A *ligament of the rectum* arises from the ischial spine and is attached to the side of the rectum. It presents a double layer of fascia with intervening loose connective tissue, and permits a sliding movement of one part over another.

A study of the relations of the pelvic structures to the layers of the fascia results in the following, according to Hart and Barbour:

Between the skin and superficial fascia:	Superficial hemorrhoidal vessels and nerves. Superficial perineal artery and nerve.
Between the deep layer of the superficial fascia and the anterior layer of the triangular ligament:	Transversus perinei. Bulbocavernosus. Erector clitoridis. Transverse perineal blood-vessels and nerves. Venous plexuses. Bulbs of the vagina. Pudendal sacs. Dorsal artery and vein of clitoris.
Between the layers of the triangular ligament:	Compressor urethræ. Vagina, in part. Urethra, in part. Pudic vessels and nerves.

194. Pelvic Diaphragm.—The structures already described as the soft parts, consisting of the pelvic fascia and the muscular structures, constitute the pelvic diaphragm, of which the most important structure is the levator ani (Fig. 107).

The origin and insertion of this muscle have been given. It is generally described as two muscles, the levator ani and the coccygeus, but as there is practically no separation, this seems an unnecessary distinction. Savage divides it into three, the pubococcygeus, the obturator coccygeus, and the

Fig. 107.—The Under Surface of the Levator Ani Muscle.—(*Deaver.*)

ischiococcygeus, but this division seems inappropriate when we recognize the fact that none of the muscular fibers arising from the pubes reach the coccyx. The anterior portion of the muscle is covered by the muscles and structures of the external genitalia. The posterior portion is enveloped with the fascia and covered with the following additional layers: the skin; the adipose tissue filling up the ischiorectal fossa, and known as the ischiorectal fat. The boundaries of this irregular triangular space are the levator ani, covered by the

anal fascia on the inner side, and the obturator internus muscle, covered by the obturator fascia on the outer side. The lower surface is bounded by the anterior edge of the gluteus maximus muscle and the greater sacrosciatic ligament behind, the transversus perinei muscle in front, and the sphincter ani upon the inner side. The apex of the triangle is at the spine of the ischium. Behind, the two fossa communicate by the loose adipose tissue back of the rectum, and also by the pelvic fascia. In front, the fossa is limited by the line of junction of the superficial and the deep fasciæ.

The posterior fibers of the levator ani pass behind the rectum and are continuous with those of the opposite side. Other fibers are attached to the tip and side of the coccyx.

Action.—The pelvic diaphragm strengthens the pelvic floor, and, in association with its two enveloping layers of fascia, forms a strong support for the uterus and bladder. Observation of the movements of the floor, with the employment of Sims' speculum, reveals a rhythmic movement synchronous with respiration. The anterior pelvic segment goes downward and backward during inspiration and upward and forward with expiration. The muscle serves to raise up the rectum during defecation and draws the anus toward the symphysis. The fibers between the rectum and vagina influence the size of the vaginal orifice.

195. Perforations (Fig. 108).—The pelvic floor is perforated by three slit-like openings, two of which, the vagina and urethra, have axes parallel with the conjugate diameter of the brim. The rectum for a part of its course is similar, but turns backward at the lower part, where it is separated from the vagina by the perineal body. The axis of the anus is at right angles with the plane of the brim. Transverse section of the pelvis through the middle and lower third of the vagina shows it folded in the shape of a letter H, with a short lateral and a long transverse bar. The urethra presents a transverse slit, and the rectum an antero-posterior fold.

196. Internal Genitalia.—The internal genitalia are: The vagina, the uterus, the Fallopian tubes, the ovaries, and the parovarium.

197. The vagina is a musculomembranous canal lying between the bladder and the rectum, and extending from the vulva to the uterus. It is fixed below by its attachments to the pelvic floor, and above surrounds the cervix, with which it is continuous. The direction of the vagina varies with the position and the condition of the adjoining organs—the bladder and the rectum. In the erect position it forms an angle of about 60 degrees with the horizon, and is parallel with the

conjugate diameter of the brim of the pelvis (Fig. 109). Its walls are irregularly triangular, with the widest point at the upper part, where the uterus enters, which in the nullipara measures 3 or 4 cm.; in multipara, 6 or 7 cm. The anterior wall is the shorter, 5 cm. long, while the posterior is 7.5 cm. In the normal condition and with the bladder empty, the cervix enters the vagina at a right angle. This angle is rendered more obtuse by distention of the bladder or by an accumulation of feces within the rectum. The vagina is attached to the cervix about 1.5 cm. from the external os, and forms with the cervix a sulcus front and back. The former is known as

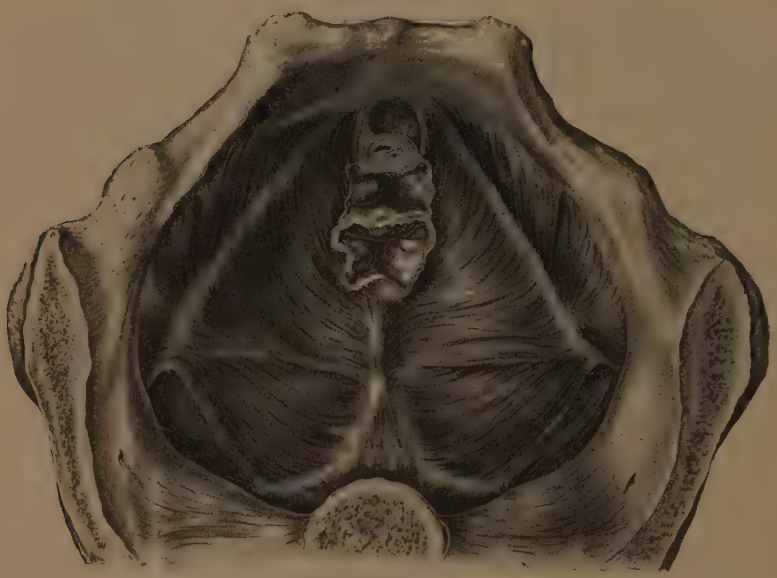


Fig. 108.—The Upper Surface of the Levator Ani Muscle.—(*Deaver.*)

the anterior, and the latter as the posterior, vaginal fornix. The anterior and posterior vaginal walls lie in contact, and, upon mesial section, present a slit with a slightly convex line directed anteriorly. Transverse section is represented by an H-shaped slit, the lateral arms of which are convex upon their inner aspect with the horizontal limb bending slightly anterior.

The vagina in multiparæ is capable of wide distention, and is of quite variable shape. The anterior vaginal wall is united with the posterior surface of the bladder by loose connective tissue, which permits its dissection, though separation rarely

occurs. The urethra is more intimately associated with this wall; however, it presents no difficulty in dissection.

The mucous membrane of the anterior wall is thrown into numerous folds or projections, called the rugæ, which are more

Fig. 109.—A Mesial Section; the Body Erect.—(*Deaver.*)

marked toward the vulva and decrease in size as the upper end of the canal is approached. There are also temporary foldings, which disappear as the vagina is distended. The

rugæ consist of a series of transverse ridges, which extend obliquely upward and outward from the longitudinal stem, known as the anterior column.

Fig. 110.—A Mesial Section; the Body Recumbent.

The transverse projections are composed of secondary ridges, covered with papillæ. The anterior column generally begins behind the meatus and disappears in the upper third of

the vagina; occasionally, its lower portion is divided into two parts by a longitudinal groove, the opposite halves of which subsequently unite. The rugæ are especially marked in young children and virgins, and largely disappear in the multipara. The posterior wall also presents a column with transverse rugæ, but less marked than upon the anterior.

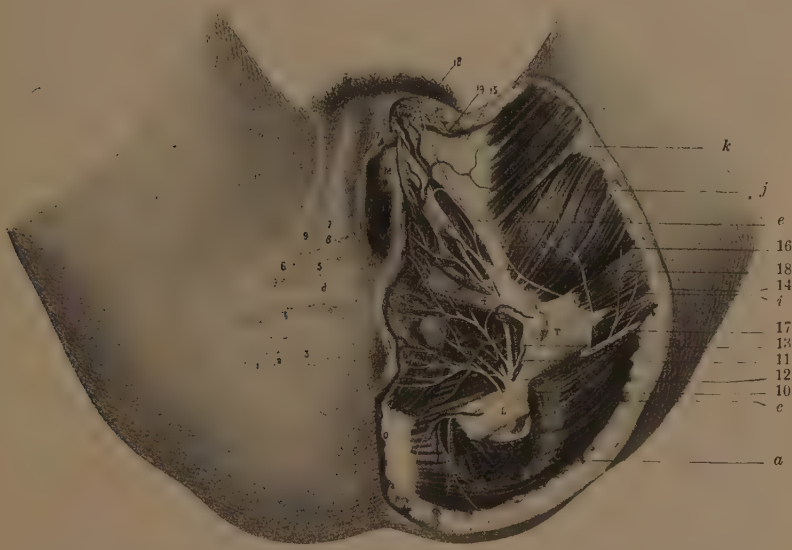


Fig. 111.—Arteries and Nerves of the Female Perineum.—(*Savage.*)

1. Internal pudic. 2, 3. Inferior hemorrhoidal. 4. Transverse perineal. 5. Superficial perineal or vulvar. 8. Artery of the bulb. 7. Profunda branch to the clitoris. 9. Dorsal artery to the clitoris. 10. Inferior hemorrhoidal nerve to sphincter and lower rectum. 11. Posterior superficial. 14. Anterior superficial branches to the vulva. 13. Trunk of the nerve. 12. Posterior muscular. 15. Anastomotic. 16. Pudendal branch of (17) the smaller sciatic. 18. 18. Continuation of pudic ending in nervous sheath for the clitoris. 19. Outer terminal branch of the ilio-inguinal nerve. A. Anus. M. Urinary meatus. C. Clitoris. L. Greater sacro-sciatic ligament. V. Vagina. O. Coccyx. *A*. Gluteus maximus. b. Superficial sphincter. *c*. Anterior edge of ischio-coccygeus. d. Superficial transverse muscle. *e*. Bulbocavernosus muscle. *f*. Slip of anterior aponeurosis of perineal septum. *g*. Upper portion of erector clitoridis muscle. *j*. Adductor magnus. *k*. Gracilis muscle. T. Nerve-fibrils to integument.

The upper part of the vagina presents, when distended, a dome-like appearance, in which the posterior fornix is twice the depth of the anterior, owing to the higher attachment upon the cervix. The lateral fornices have no especial depth, and only connect the anterior and posterior. As the patient

advances in years the vaginal walls atrophy and the rugæ gradually disappear.

The wall of the vagina consists of three layers: an external connective-tissue layer; a middle, of unstriped muscular fiber; and an inner, of mucous membrane. The exterior layer binds the uterus to the surrounding structures and supports the plexus of vessels and lymphatics. The muscle structure consists of longitudinal and circular fibers, intricately interlaced. A bundle of striated muscle-fibers is described by Luschka as surrounding the lower end of the vagina as well as the urethral orifice, which he calls the sphincter vaginæ.

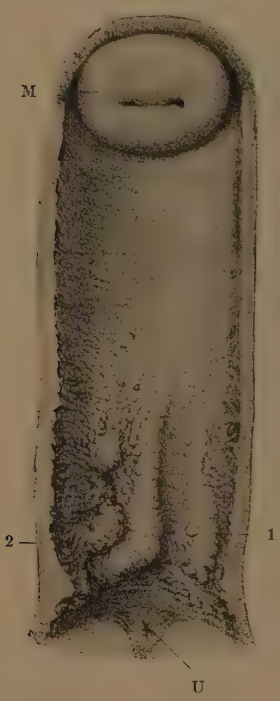


Fig. 112.—Anterior Wall of Vagina Showing Columnæ Rugarum.—(*Byford, after Savage.*)

1, 2. Anterior columns of the vagina. U. Urethral orifice. M. Cervix.

The mucous membrane, which extends from the free edge of the hymen to the cervix, over which it is reflected to the external os, varies in thickness from 1 to 1½ mm. It is of a rosy-red color, but may vary from a light pink to a dark purple or slate-color. The latter color is especially characteristic of pregnancy. The mucous membrane is closely attached to the subjacent muscular layer, and is thrown into the already mentioned rugæ. The surface is covered with numerous papillæ, which are greatly increased in size by pregnancy.

The mucous surfaces are covered with an acid mucus, which is also markedly increased during pregnancy.

The thickness of the vaginal wall is greater below, where it is about one centimeter, while at the upper part it is not over five millimeters. The difference in thickness is due to the variation in the muscular wall.

A microscopic section of the vaginal wall presents an external layer of fibrous tissue, enveloping large veins, which belong to the vaginal venous plexus. These are surrounded by bundles of smooth muscle-fibers suggestive of erectile structure. Accompanying the veins are large lymphatics, some of which are distended to form sinuses. A middle or muscular layer is also present, in which the outer fibers seem divided transversely; the inner ones being longitudinal.

The mucous membrane consists of a firm basement membrane in which are numerous elastic fibers. It is covered by several layers of stratified pavement epithelium (Fig. 113). In addition to the large folds into which the mucosa is thrown, it forms secondary elevations, or papillæ, in each of which is a capillary loop. These loops are single near the fornix, but present a more complicated network near the introitus.

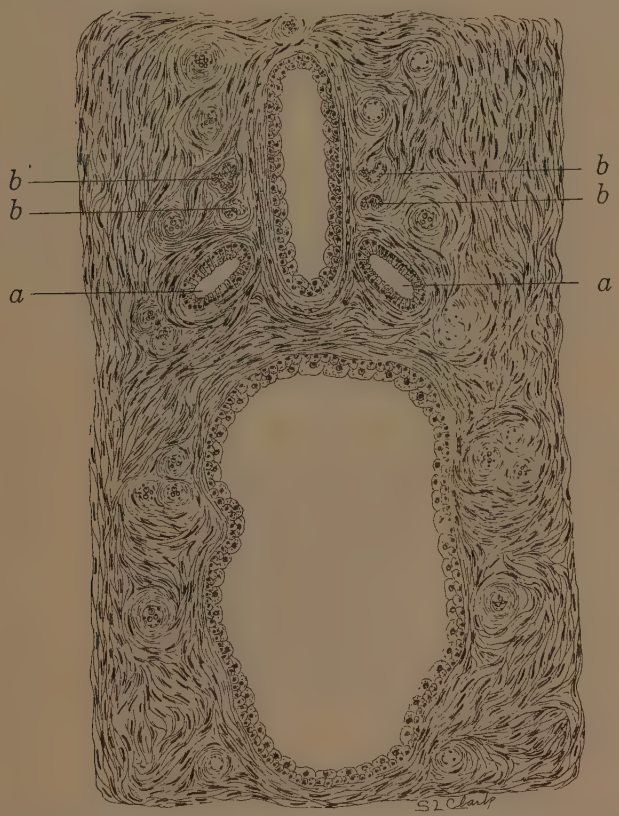


Fig. 113.—Horizontal Section of the Vagina and Urethra of an Infant. *a*, *a*. Skene's glands. *b*, *b*, *b*, *b*. Urethral glands; the analog of Littre's glands in the male.

The rugæ consist of large venous plexuses surrounded by bundles of muscle-fibers, as in cavernous tissue.

The lymphatics are abundantly supplied to the mucosa. Lauenstein has described lymph-follicles similar to those in the intestine.

The existence of mucous follicles or glands in the vagina is denied; the mucus is believed to be an exudation from the vaginal surface.

The nerves ramify throughout the walls, communicate with one another and with the ganglia, and terminate in end-bulbs beneath the epithelium.

198. The uterus, or womb, is a hollow, thick-walled, muscular organ, of a truncated shape, which occupies the upper part of the cavity of the pelvis and projects by a portion of its cervix into the vagina. It is situated between the bladder in front and the rectum behind. The fundus is usually just below the level of the plane of the brim of the pelvis, and about two centimeters in front of the sacrum. The position of the uterus is dependent upon the condition of the surrounding organs. When the bladder is empty and the rectum undistended, the uterus is slightly anteflexed, and occupies a position at a right angle to the axis of the vagina. The fundus is directed forward and upward, and the cervix downward and backward, toward the rectum. A distended bladder raises the fundus and decreases the uterovaginal angle. A similar change of position is induced by rectal accumulations which push the cervix forward. It necessarily is difficult then to determine between a physiologic and a pathologic position. We may call any position abnormal in which the organ becomes fixed and its range of mobility lessened. The uterus presents, from above, a pear-shaped appearance, slightly flattened from before backward, and the posterior surface is the more convex.

The length of the virgin uterus is from 5 to 7.5 cm.; its breadth at the orifices of the Fallopian tubes, 5 cm.; and its walls are about 1 cm. thick. The weight of the nonimpregnated uterus is from about 300 grains to 1½ ounces. The organ is divided into two portions—the body and the cervix. The body, pyriform in shape, about 4 cm. long, is surmounted, above a line drawn through the orifices of the Fallopian tubes, by a rounded portion—the fundus. The cervix, cylindric in form, is about 3 cm. long and terminates below in the vaginal portion. Schröder divides the cervix into three parts: the upper and lower, called the supravaginal and infravaginal portions, which are separated by an intermediate portion—a division which is of significance in the study of uterine displacements.

The attachment of the vagina to the uterus is much higher behind. When the patient occupies the dorsal position, with the limbs well drawn up, the vagino-uterine junction is upon a plane vertical to the horizon. The infravaginal portion of the cervix is especially interesting to the gynecologist, as it is the only part of the uterus which is visible upon inspection, and fully accessible to palpation. It varies extremely in size

and shape, according to the age and sexual relations of the individual. In the virgin it presents a conoid projection, nearly one centimeter long, with an opening in its apex, known as the external os, or os tincæ. The os is a transverse slit, about two or three millimeters long, and it divides the cervix into an anterior and a posterior lip. The anterior lip is the longer.

With the advent of sexual activity the cervix changes.

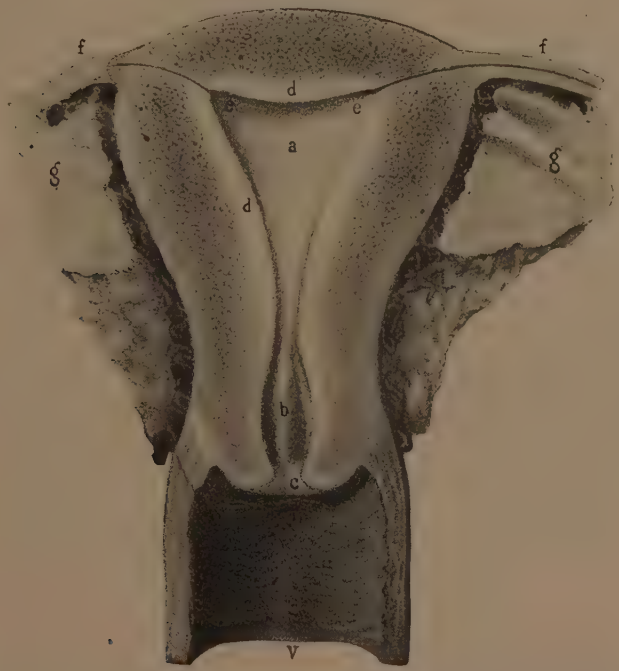


Fig. 114.—Median Section of Uterus from Side to Side through the Fallopian Tubes. Mode of Junction of Vagina and Uterus.—(*Savage.*)

a. Uterine cavity. b. Cervical canal, showing folding of its mucous membrane. d. Internal uterine (mucous) coat. c. Os externum uteri. e. Uterine aperture to Fallopian tube. f. Fallopian tube near uterus. g. Round ligament. V. Vagina.

In the nulliparous married woman it becomes softer and larger, the conoid shape is less marked, and the os stands more widely open. In the multipara, even when lacerations have not occurred, the cervix is large and soft, and the os presents a transverse slit, more frequently an irregular opening. Inflammatory lesions cause the cervix to become still larger, with eversion of the mucous membrane, erosion of the surface, enlargement of the papillæ, and an irregular opening.

With the cessation of menstruation, and especially in women who have borne a large number of children, the vaginal cervix disappears and the os is flush with the fornix of the vagina.

The junction of the triangular body and conoid cervix is called the isthmus. The anterior surface is flattened; the posterior, quite convex. The upper border of the uterus is rounded, and forms the fundus. The lateral uterine borders are obscured by the folds of the peritoneum, known as the broad ligaments. The upper part of each ligament is occupied by the Fallopian tube; below this, the round ligament; and still lower, the ovarian ligament.

The arteries, veins, and lymphatics of the pelvis pass through the broad ligament.

The uterine canal in the virgin (Fig. 114) is about five centimeters long; slightly longer in the multipara. The cavity of the cervix is cylindric, wider in the center and narrower at each end,—with the external os below and the internal os above.

The cavity of the body is triangular from side to side, but the anterior and posterior surfaces lie in contact. At the apex of each angle of the triangle is found an opening, on each side the orifices of the Fallopian tubes, and below the internal os.

The uterine wall has a thickness of a little more than one centimeter. The uterus has three layers—an external (serous), a median (muscular), and an internal (mucous membrane). The serous or peritoneal covering is not complete, and, therefore, will be considered with the peritoneum.

The muscle-fibers are best studied in the pregnant uterus, and may be divided into three layers. The external is most distinct, and consists of a fine, thin layer over the anterior and posterior surfaces, from which prolongations are sent off into the broad ligament. The posterior fibers form the ovarian ligament, and the anterior the round ligament. Some of the fibers also furnish the longitudinal muscular structure of the Fallopian tube. These fibers are wanting upon the sides of the uterus. The middle layer is by far the thickest, and consists of interlacing fibers, transverse and longitudinal, which are continuous with those of the vagina. This layer comprises the principal part of the wall, and contains the blood-vessels. The latter are embedded in a network of fibers, and may be recognized with the naked eye upon cross-section. Their intimate relation to the muscle and tissue is recognized by their remaining open when divided transversely.

The inner layer consists of circular fibers, which are most marked at the internal and external os, where they form a sort of sphincter, and at the cornu of the uterus, from which they are extended into the Fallopian tubes.

The connective tissue of the uterus is thickly interspersed between the muscle-fibers, and especially along the course of the vessels. The mucous membrane of the uterine cavity rests directly upon the muscle layer without any intervening submucosa, and its glandular structure projects between the muscle-fibers. In the cervical cavity, where the mucosa is thrown into folds, a distinct areolar layer intervenes between it and the muscular wall. The uterine mucosa is one millimeter in thickness at the fundus, but becomes thicker near the center of the cavity. It is smooth and velvety, of a grayish-red color, and presents no folds, unless in the immediate vicinity of the tubal opening, and there but a slight folding. Under a glass can be seen numerous small depressions or openings—the orifices of the glands. The free surface of the mucosa is covered with a single layer of columnar epithelial cells, which are supplied with cilia. The mucosa is filled with glands of the tubular variety, which penetrate its entire thickness, and frequently their external extremities are embedded in the muscular layer. (See Fig. 116.) The direction of these tubules is more or less oblique. They often exist as sinuous or spiral

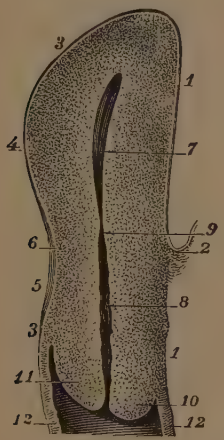


Fig. 115.—Virgin Uterus, Median Section.—(*Byford, after Sappey.*)

1. Anterior surface. 2. Vesico-uterine pouch. 3, 4, 5, 6. Posterior surface. 7. Cavity of corpus. 8. Cavity of cervix. 9. Os internum. 10, 11. Vaginal portion of cervix. 12. Vagina.

Fig. 116.—Mucous Membrane of Uterine Body Showing Follicles.—(*Mann.*)

d, d, d. Simple or double culdesac of these follicles. *a, a, a.* Thin cup-shaped orifice upon the mucous membrane.

single tubes, but more frequently divide into two or more branches near their lower ends. Upon longitudinal section they exhibit a basement membrane lined by a single layer of prismatic ciliated cells with single large nuclei situated near their bases. (See Fig. 117.) These glands largely increase with the approach of puberty, and become elongated during

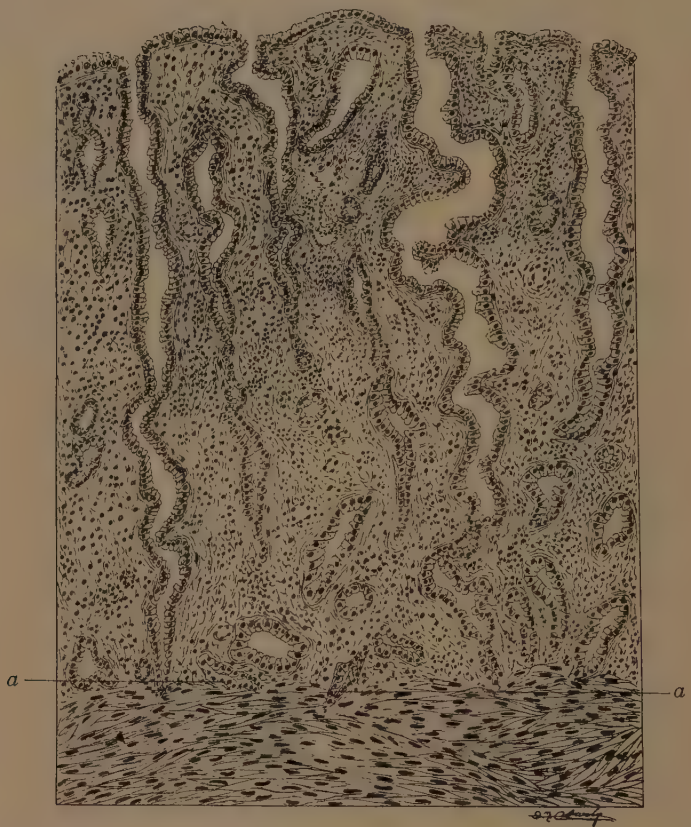


Fig. 117.—Section of Normal Endometrium. Note two glands to right somewhat enlarged.

a, *a*. Glands penetrating muscular substance.

menstruation, and especially in pregnancy. The mucosa is supplied with large plexuses of capillaries and lymphatics. The latter, in the form of lymph-spaces, are directly connected with the lymph-sinuses and vessels of the deeper layer. The termination of the nerve-filaments in the mucosa has not been determined, but the action of the glands indicates their reception

of nerve-filaments, as in similar structures of other parts of the body.

The cervical mucosa, thicker than that of the body, is thrown into several folds, known as the arbor vitæ, or plicæ palmatæ, and is separated by a submucosa from the muscular wall. This arrangement of the mucosa ends sharply at the internal os, and is best observed in the virgin cervix. The mucosa differs from the lymphoid structure of the body in having a firm, fibrous basement membrane, surmounted by cylindric epithelial cells. These cells, according to De Sinety, are ciliated only upon the summit of the ridges, while the epithelium covering the intervening surfaces is nonciliated. The glands are of the racemose variety, consisting of branching ducts. They are lined with nonciliated cuboid epithelium, resting upon a structureless basement membrane. They open upon the free surface, upon and between the folds, and secrete a clear, viscid, alkaline mucus. The ovula Nabothi are those glands which have formed small cysts after occlusion of their ducts.

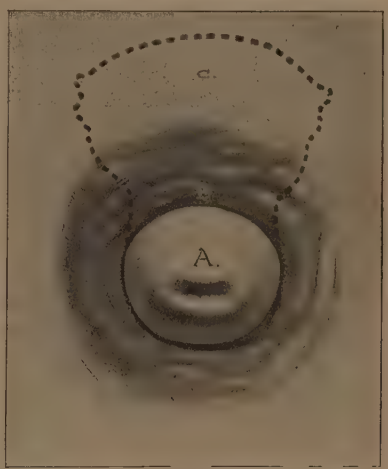


Fig. 118.—Virgin Os and Cervix.—(*Sappey.*)

The structure of the cervical wall differs from that of the body in the increase of fibrous tissue, which is intimately interwoven with the muscle-fiber, and in the lessened supply of blood-vessels.

The external os presents a sharp line of demarcation between the one-layered cylinder epithelium of the cavity and the multiple-layered pavement epithelium of the vaginal portion.

199. The **Fallopian tubes,** or oviducts, are two tortuous canals which arise from each side of the fundus uteri. They vary in size and length, occupy the upper margin of the broad ligament, and extend outward almost to the pelvic brim. The length of the tube is from 7.5 cm. to 12.5 cm., the right tube usually being the longer.

They are first directed outward, then backward, and finally inward, giving the appearance of a shepherd's crook. The tube presents for our study: first, in the uterine cavity a narrow funnel-like opening, the ostium uterini tubæ; 2, the section of the canal found in the uterus, pars uterini; 3, the narrow

portion proximal to the uterus, the isthmus tubæ; 4, a wider, longer, more tortuous portion, the ampulla tubæ, which terminates in, 5, a distinct trumpet-shaped end, the infundibular tubæ, provided with numerous fimbriæ, and 6, a distinct opening from the ampulla, the ostium abdominale tubæ. The line of differentiation between the pars uterini, isthmus, and ampulla is not sharply defined. The isthmus is the narrowest portion and is about two centimeters long. The diameter of the isthmus is about two millimeters, and its lumen will scarcely admit a bristle. The ampulla is the more widened part; it extends outward and backward, has an external diameter of from six to eight millimeters, and its lumen a diameter of two or three millimeters.

The fimbriated extremity—also called the pavilion, or infundibulum, from its funnel shape, and the morsus diaboli (devil's mouth)—is a trumpet-shaped opening, surrounded by primary and secondary fimbriæ, which resemble the tentacles of the sea anemone. The primary fimbriæ are the larger processes, four or five in number, from which arise the eight or ten secondary processes.

The longest fimbria (fimbria ovarica) anchors the tube to the ovary and has a furrowed groove, which facilitates the passage of the ovum to the tubal orifice. The broad ligament is continued to the lateral wall of the pelvis by a small fibrous band, known as the infundibulopelvic ligament.

The tube, upon repeated section, will be found to have varying dimensions, and frequently its course is tortuous, almost convoluted. It has two openings—the uterine and the abdominal. The latter is more distensible than the remaining portion of the tube, is somewhat trumpet-shaped, and affords a communication with the peritoneal cavity.

The tube has four coats: the external, a serous, which is separated from the muscular by a subserous coat, the tunica adventitia; the middle, a muscular; and the internal—the mucous membrane.

The external serous covering is incomplete, that portion of the tube toward the broad ligament being incomplete for the inner two-thirds of the tube. The remaining third is surrounded by the peritoneum, which covers the external surface of the fimbriæ, while the internal is lined by the mucosa. The tunica adventitia envelops the muscular layer, allowing the peritoneal to slip over its abdominal end. The muscular coat consists of longitudinal and circular fibers. The former is continuous with the outer; the latter, however, is predominant and the continuation of the inner muscular layer of the uterus. The muscular structure is more largely developed at the prox-

imal than at the distal end of the tube, and the circular fibers are particularly well marked at the isthmus, where they form what is called the sphincter tubæ. The tubal mucosa is quite thick, thrown into longitudinal folds, very vascular, and of a bright red color. In the isthmus the mucosa presents simple folds, which become more complex in the ampulla. Hennig has counted from three to five primary folds, which have between eight and ten smaller plicæ between each pair of the former. The secondary folds are less marked near the abdominal extremity, where the longitudinal folding is apparent to the naked eye.

The mucosa has a single layer of ciliated columnar epithe-

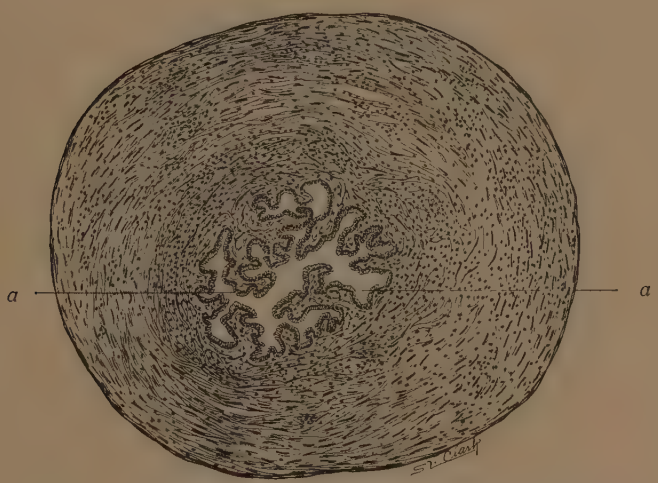


Fig. 119.—Section of Fallopian tube through the isthmus.
a, a, shows the firm and compact structure of the longitudinal folds in this portion of the tube.

lium upon two or three layers of supporting cells, which are round or pyriform. The cells abruptly terminate at the ends of the fimbriæ, where the margin between the columnar and pavement epithelium is distinctly marked. The tubal mucosa, like the uterine, has no distinct submucous layer, but unlike the latter it is without glands, and is covered with a thin layer of grayish mucus of a distinctly alkaline reaction.

200. Ovaries. — The ovaries, the germ-bearing organs of the woman, and the analogs of the male testicle, are a pair of small bodies, situated one upon the posterior surface of each broad ligament, below the tube and at each side of the uterus.

The ovaries occupy a position at the level of the brim of the pelvis, or partly below and partly above its plane.

The axes of the ovaries lie obliquely to the pelvis, with a slight inclination forward. In the erect position they rest upon the posterior surface of the broad ligament.

The Fallopian tube is situated in the broad ligament above the ovary and partly encircles it, while the round ligament is in front and occupies the anterior fold of the broad ligament. In front of the ovary, between it and the tube, is the parovarian structure, or the organ of Rosenmüller. The inner or uterine extremity of the ovary is connected with the uterus by some muscle-fibers, about three centimeters long, known as the

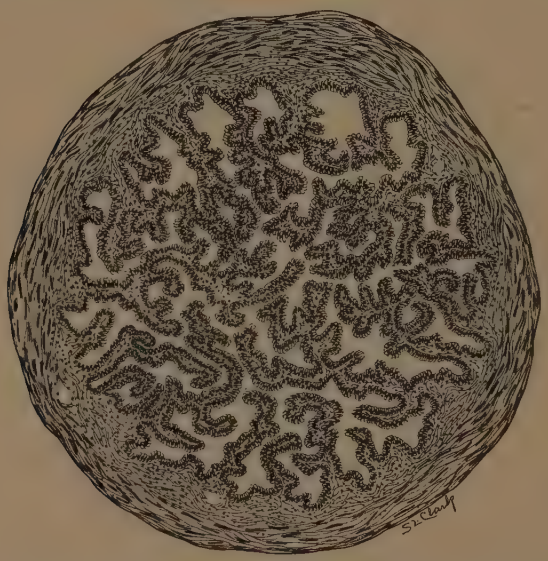


Fig. 120.—Section of the Fallopian tube through the ampulla near the isthmus, showing extensive folding of the mucous membrane.

ovarian ligament; the outer or tubal extremity is connected, above, with the end of the tube through the fimbriæ ovarica, and below, with the infundibulopelvic ligament.

The ovary presents a flattened, ovoid appearance, with its broad end directed externally and the pointed end toward the uterus. The anterior, straight or flattened surface of the ovary is fixed by a short serous duplication, the mesovarium, to the posterior surface of the broad ligament. The posterior convex margin is free. Its size varies with the age of the individual, the functional activity of the organ, and the occurrence of menstruation or pregnancy. The ovary attains its greatest

size about six weeks after parturition (Hennig), and never reaches its former size in the subsequent involution.

Following the menopause, it shrinks to one-half or one-third of its dimensions during active sexual life. Luschka gives its dimensions as: length, 4 cm.; width, 2.2 cm.; thickness, 1.3 cm. It weighs from 60 to 135 grains.

The color of the ovary is a pinkish-gray, becoming somewhat darkened as menstruation approaches. Immediately after ovulation a dark swelling follows, due to the accumulation of blood. As absorption progresses the color changes, and the mass becomes yellow, and later presents only a whitish cicatrice. Before puberty the ovary is smooth, but subsequently it becomes irregular, from the cicatrices following repeated rupture of cysts, or nodular, from the presence of matured follicles that have failed to rupture. Following the menopause, the ovary becomes a pearly-white, irregular, almost cartilaginous mass, about one-half or one-third its former size.

The ovary is situated upon the posterior surface of the broad ligament, with its pointed end connected with the uterus by the ovarian ligament. The ovary, by its pointed end, is directed toward the ligament, and its stroma extends inward upon the latter, while the external ovarian end is blunt and large. The posterior surface of the ovary projects through the peritoneum, and is uncovered by it. The union of the columnar epithelium of the ovarian surface with the pavement epithelium is readily recognized as a white line, and is called the white line of Farre.

Sections of the healthy ovary show two kinds of tissue, a central or medullary, and a cortical or peripheral portion. The latter covers the entire surface of the ovary bounded by the line of Farre, but projects to its greatest depth (two to three millimeters) at the central portion of the convex surface. The central structure has a pinkish-gray or rosy color, is of soft consistence, and has a moist glistening appearance. It is of a white or grayish-white color, more or less firm in consistency, and contains numerous small vesicles. The smaller vesicles are situated near the surface, while larger cysts are situated deeper. Some of these reach the size of a pea, and may project more or less beyond the free surface. The sac-wall is frequently so thin that the vesicles rupture under the slightest pressure. This layer also contains numerous depressions, or scars, the result of repeated ovulation.

The cortical layer of the ovary, or that part which projects through the peritoneum, is covered by a single layer of short, columnar epithelium, called by Waldeyer the germinal epithelium. This terminates abruptly at the white line, where the

pavement epithelium of the peritoneum begins. Before puberty young ova are represented by large spheroid cells, with marked nuclei, which form in the columnar cells. Ingrowths of the germ epithelium into the underlying stroma are occasionally seen, which form the ovarial tubes of Pflüger.

Immediately beneath the epithelial layer, and quite inseparable from the underlying stroma, is the tunica albuginea—a thin, dense layer of fibrous tissue, which contains a few smooth

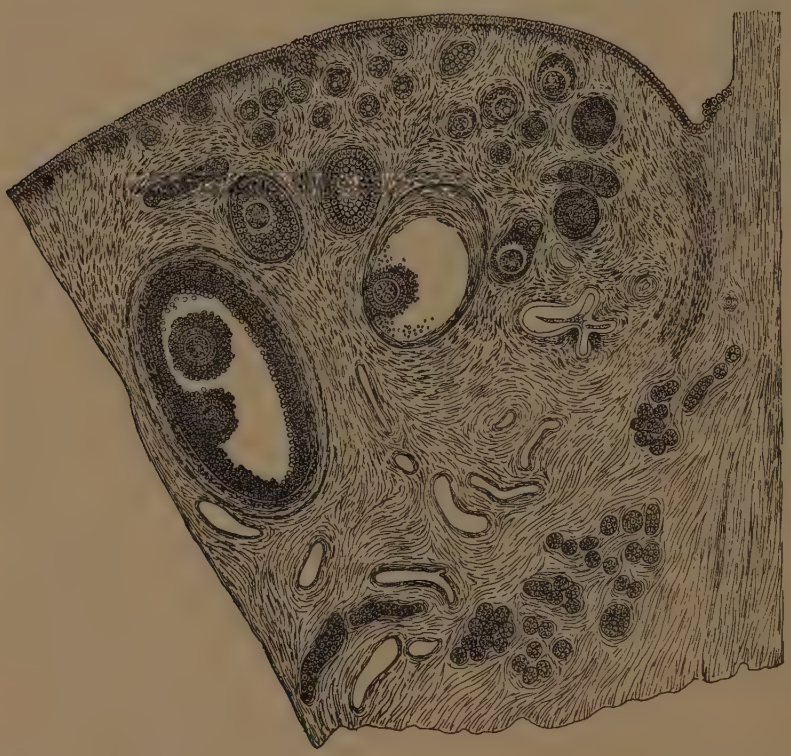


Fig. 121.—Section of Ovary, Showing Graafian Follicles.—(*Wyder.*)

muscle-fibers. It is not completely developed until the third year, and undergoes changes with age and inflammation until it becomes thickened and of almost cartilaginous hardness, which renders its rupture exceedingly difficult. Such alterations from inflammatory changes are a cause of the formation of retention cysts, and of the development of that condition known as cystic disease of the ovaries. The structure of the ovary, as already noted, is divided into a cortical and a medullary portion, although they differ but little in structure except that

the latter is softer and more vascular. In the cortical layer lie the Graafian follicles, embedded in connective tissue, interspersed with some muscle-fibers. A large number of these follicles, variously estimated at from 36,000 to 400,000, are found in each ovary. Whether so large a number exists is difficult to determine, but it remains evident that nature has amply provided for the reproductive function.

The ovarian stroma is the framework or bed in which the follicles rest and are nourished. Each Graafian follicle has a wall, which consists of a tunica fibrosa of thin fibrous tissue, within which is a more delicate membrane, called the tunica propria; the latter contains many granular cells and a fine network of capillary vessels. This tunica propria is lined with several layers of epithelial cells, called the membrana granulosa. These cells are separated from the tunica propria by a structureless membrane. These epithelial cells form a thickened mass upon one side, which projects into the cavity—the discus proligerus. The cavity of the follicle is filled with a clear, serous fluid, called the liquor folliculi. It is formed by liquefaction of the cells of the membrana granulosa.

The Graafian follicle, when mature, is one millimeter in diameter. Embedded in the discus proligerus is found the ovum, which has been called the typical cell; it measures from 0.2 to 0.3 mm. It is a yellow, spheroid body, enveloped by a thin, delicate membrane,—the vitelline membrane, or zona pellucida, doubtless formed from the innermost cells of the discus proligerus. Within this membrane is contained the vitellus, a network of granular, fibrillated protoplasm containing numerous fat-globules. In the outer portion of this network is a light spot, which consists of fine, fibrillated protoplasm, which contains in its meshes a granular material inclosed in a distinct membrane. This structure is known as the nucleus, or germinal vesicle. Within this is contained a small, highly refracting, granular body, known as the nucleolus, or germinal spot.

The Graafian follicle is surrounded by a vascular network; as it matures, the liquor folliculi increases, the cyst becomes tense, approaches the surface, and the tunica albuginea becomes thinned and finally ruptures, permitting the ovum to escape. The cavity of the follicle fills with blood, which coagulates and forms a clot. Later, this clot presents an external yellowish color, while its center is of a reddish-gray hue. The clot gradually becomes organized, contracts (by which it is thrown into folds), and is gradually absorbed. The clot thus formed is known as the corpus luteum. The ovary of a normally menstruating woman will be found to contain a number of

corpora lutea in various stages of retrogression. The structure generally disappears by the end of the twelfth week, excepting a small cicatrice, which remains.

When pregnancy occurs, the corpora lutea do not continue to form, but the one corresponding to the last menstruation becomes much larger and remains longer. It continues to increase, and after the first month forms a large yellow clot, which gradually becomes decolorized and more highly organized, resulting in a white, fibrinous clot surrounded by a yellow ring. The corpus luteum of pregnancy is known as the corpora lutea vera, while those which occur with ordinary ovulation are called corpora lutea spuria.

Fig. 122.—Large Corpus Luteum in Association with an Ovarian Dermoid. Removed from an Unmarried Woman Who Had Never Been Pregnant.—(*Sutton.*)

1. Twisted pedicle. 2. Corpora luteum. 3. Old clot. 4. Integumentary surface of dermoid.

Later in the pregnancy, the time of which is not exactly known, it becomes contracted, and at its termination forms a mass about 0.5 cm. in diameter.

When the corpus luteum has lost its color and most of its blood-vessels, and is mainly composed of a mass of fibrous tissue, it is called a corpus albicans. Frequently, from the retention of pigment, it is dark in color, and is known as a corpus nigricans. Clark has shown that the corpus luteum finally disappears by the process of hyaline degeneration. Extravasations of blood, or apoplexy of the ovary, we shall see later, are not infrequent, and occasionally may result in the complete destruction of the organ and the formation of a blood-sac—an ovarian hematoma.

201. The Parovarium.—Between the outer end of the tube and the ovary is situated a triangular group of small tubules, known as the parovarium, or the organ of Rosenmüller—a remnant of the Wolffian body.

The structure corresponds to the epididymis in the male. The apex of the triangle is directed toward the ovary. This organ is of especial importance to the gynecologist, as it can be the seat of a number of growths. It consists of from six to thirty spiral tubules, which at their base open into a single transverse tube. This transverse tubule corresponds to the canal of Gärtner in the lower animal. Cysts are frequently found associated with the tubules; the most common is the hydatid of Morgagni, or appendix vesiculosa, the pedicle of which arises in a point of the mesosalpinx, near the fimbria ovarica. The occurrence of this cyst is the rule rather than the exception, and it consists of a tough connective-tissue wall with a well-developed vascular system, and is lined with pavement epithelium. It has a pedicle one-third centimeter long and contains clear fluid. The parovarium is entirely a rudimentary structure, and has no function.

202. Urinary Organs and Rectum.—Our knowledge of the relations of the pelvic organs will be incomplete without a study of the analogy of the urethra, bladder, and ureters, as well as of the rectum and anus.

203. The urethra is a canal, from 2.5 cm. to 4 cm. long, which forms the outlet to the bladder. It lies embedded in the anterior vaginal wall, from which it can readily be separated. It is slightly curved upward, with its concavity forward. Upon cross-section the urethra presents a transverse slit near its vesical end and a stellate folding toward the external meatus. The diameter of the urethra is 0.6 cm., and it is quite distensible. When not distended, the urethral mucous membrane is more or less corrugated throughout its length, owing to the sphincter-like action of the surrounding muscle-fibers. The urethra is attached to the pubic arch by the pubovesical ligament, and penetrates the triangular ligament, between the layers of which it is surrounded by the fibers of the compressor urethræ, or muscle of Guthrie.

It is also, together with the vagina, influenced at its lower end by the bulbocavernosus muscle. Its external opening is known as the external meatus, and close inspection of its orifice will reveal a number of small openings about it—the orifices of the glandulæ vestibulares minores. Within the meatus are two small openings—the orifices of the tubules, described by Skene. They correspond to the lacuna magna in the fossa navicularis of the penis.

They are described by Skene as tubules which extend for a distance of nearly one centimeter parallel with the urethra. As a result of inflammation they can be so dilated that they will admit a No. 1 probe, and even the point of a catheter.

The urethra is nearly parallel with the bladder, but when the woman is erect it is nearly vertical.

The urethral mucous membrane, like that of the vestibule, is of the pavement variety. The glands are lined at their mouths with pavement epithelium, which soon changes into the columnar variety.

204. The bladder is situated in the anterior part of the pelvis, between the symphysis pubis in front, and the vagina and uterus behind. Its shape is constantly changing with the accumulation and evacuation of the urine. When empty, the urethra forms the stem of a Y, the anterior limb of which is the longer. Between the urethra, the anterior surface of the bladder, and the symphysis is a triangular space filled with the retropubic fat. The bladder, when moderately distended, becomes rounded; and when full, oval. The female bladder holds less than that of the male, and differs from it also in having the transverse diameter longer than the vertical. The bladder is divided into three portions: the body; the base, or fundus; and the neck. Skene defines the former as that portion which lies above a plane formed by the ureteric openings and the center of the symphysis pubis. The portion below is the fundus, or base, which includes the trigone, or space between the orifices of the ureters and internal meatus, and the bas fond, the space immediately behind the ureters. The thickened surface about the urethral orifice is the neck, which is the most dependent portion when the body is erect.

The bladder-wall consists mainly of muscular structure. The wall, dependent upon the amount of distention, varies from 0.5 to 1 cm. The muscular structure consists of longitudinal and circular fibers, the former mostly confined to the anterior and posterior surfaces. They may be traced from the vesical neck and pubes in front, where they are called the musculi pubovesicales, to the summit, where some of the fibers accompany the urachus.

The circular fibers are more marked near the vesical orifice, where they form the sphincter vesicæ.

The muscular layer is partly covered externally by the peritoneum, which will be discussed later, and internally by the mucous membrane, with which it is loosely connected by a layer of fibrous and elastic tissue. Because of this loose connection, the mucous membrane is thrown into folds when the bladder is empty, except at the trigone, where it is more

intimately connected with the submucous layer and is much thinner.

The mucous membrane in life presents a rosy pink appear-

Fig. 123.—Vesicovaginal Septum and Base of Female Bladder. Anatomic Relations of Ureters at Their Entrance into the Bladder. Contents of Alar Ligament.—(*Savage.*)

1, 1. Ureters. 2. Uterine artery. 3. One of the uterine veins. 4. Dotted line indicating the vaginal end of the uterine cervix. 5. Internal meatus urethræ. 6. Ligamentous process of fascia of pubococcygeus muscle and vesicopubic muscles. 7. Pubococcygeus muscle. U. Uterine body. O. Ovary, utero-ovarian muscular ligament, and grooved Fallopio-ovarian fimbriæ. T. Fallopian tube and fimbriæ inverted. M. Parovarium. P. Pubic arch. V. Body of bladder.

ance, and is continuous with that lining the urethra and ureters. Its epithelium consists of three or more layers of epithelium resting upon a basement membrane. The superficial cells are

squamous, but are smaller than the vaginal. The inferior layer is composed of columnar epithelium with long processes, while the middle one is made up of pyriform cells. The membrane is supplied with a rich plexus of fine capillaries and nerve-fibers; the latter are not marked in the trigone.

The bladder is but poorly supplied with lymphatics, and they communicate with the glands near the internal iliac artery.

205. The ureters are the urinary ducts through which the urine is carried to the bladder. Their course, previous to crossing the iliac arteries, is nearly parallel. The left ureter lies behind the sigmoid flexure of the colon. In their subsequent course the ureters extend downward, backward, and outward, along the lateral walls of the pelvis. At the spine of the ischium they bend downward, forward, and inward to the bladder, passing behind the uterine arteries, and about 1 to 1.5 cm. on each side of the cervix. The distance between the ureters where they enter the bladder is 5 cm. They pass obliquely through the vesical wall and enter the bladder 2 cm. below and external to the cervix, where their orifices are still 4 cm. apart, but united by a prolongation of the longitudinal fibers of the ureter, known as the interureteric ligament. This ligament forms a transverse ridge between the two orifices, and serves as the base of the vesical triangle.

206. The Rectum.—The rectum is the lower extremity of the large intestine, and begins with the termination of the sigmoid flexure, at the level of the third sacral vertebra, to end with the anus. The rectum in its course from the third sacral vertebra is directed downward and forward behind the cervix uteri and vagina, parallel with the latter, until it turns directly backward at the anus. The relation of the rectum to the pelvic structures naturally divides it into two portions, the pelvic and the perineal portion. The pelvic portion begins opposite the third sacral vertebra and ends at the insertion of the levator ani into its wall. The perineal portion lies between the muscle and the anus. The space formed by the deviation of the rectum from the line of the vagina is occupied by the perineal body. The portion of the rectum involved in this deviation, which is about 2.5 cm. long, is known as the anus.

The entire length of the female rectum is twenty centimeters. The canal is less curved than in the male and its caliber is greater. The longitudinal muscular bands so characteristic of the colon are absent.

The rectum, artificially distended, shows a very large sac, immediately above the anus, which decreases as the sigmoid flexure of the colon is approached. This very dilatable portion is called the ampulla, and when empty the anterior surface

lies in contact with the posterior, so that upon transverse section it presents a transverse slit.

The anal orifice is quite dilatable. The anus forms an aperture which closes with its lateral surfaces in contact. The orifice is further obstructed by eight or ten longitudinal folds of the mucous membrane. These folds are called the "columns of Morgagni," and the depressions between them, the "sinuses of Morgagni." These corrugations are produced by the contraction of the sphincter, and disappear when the anus is distended. Above the anus are three ring-like zones which are superimposed over each other. The first is the zone of the rectal columns and the intervening sinuses. The mucous membrane upon the surfaces of the columns is covered with pavement epithelium, while in the depressions cylindrical epithelium similar to that of the bowel above is found. Lieberkühn's crypts are seen only in the upper portion of this zone. Its boundary is often recognized as a distinct line, the linea ani rectalis (Hermann). The middle zone has a smooth, bright mucous membrane covered with pavement epithelium and small papillæ. The lower zone is the cutaneous zone. This has the horny epithelium well supplied with pigment and also the connective-tissue sub-layer characteristic of the skin. We find here papillæ, hair, and sebaceous glands, adjoining the large convoluted glands of the intestine. The submucous layer consists of a structure of quite dense connective tissue, in which are situated the blood-vessels, nerves, and lymphatics. Its laxity permits the mucous membrane to glide over it. The mucous membrane of the rectum above the anal canal has three or four large permanent transverse or oblique semilunar folds which often project quite a distance into the lumen of the bowel. These folds, according to Gant, are crescent-shaped, capable of some vertical motion, and extend about one-half to two-thirds the circumference of the rectum and project into its lumen from three-fourths of an inch to an inch and a half. They are situated obliquely to the long axes of the bowel. They are slightly cup-shaped with the concavities looking upward. With the bowel distended the free margins of these valves are prominent and readily seen through the proctoscope. They are called Houston's valves. The number of them is variable; usually there are three. In exceptional cases there may be five, six, or even seven. Their location is fairly constant. The upper valve is situated at the junction of the sigmoid and the rectum on the left rectal wall. The middle, which is the most prominent, occupies the right anterior wall opposite the base of the bladder and is three inches or more above the anus. The lower valve is situated

on the left side and a short distance below the middle valve. With the patient in the knee-chest posture and the rectum well inflated, one can often see, by the aid of the proctoscope, all these valves at the same time. They generally form a sort of spiral stairway which gives a rotatory motion to the fecal mass as it progresses toward the anus.

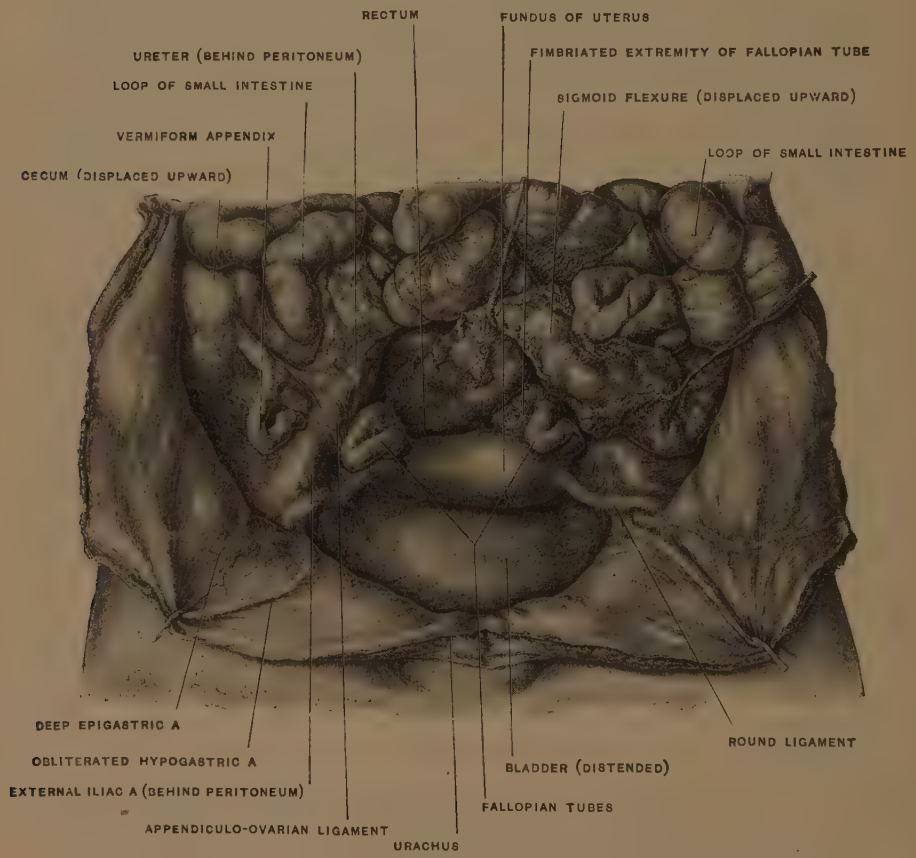


Fig. 124.—Superior View of the Pelvic Cavity.—(*Deaver.*)

The rectal wall is composed of three coats—the peritoneal, the muscular, and the mucous membrane.

The arrangement of the serous coat will be considered with the peritoneum, but it should be remembered that a portion only of the rectum is enveloped by peritoneum. The muscular layer consists of longitudinal and circular fibers, but

the former are more generally distributed, and not collected into bands, as in the colon. The circular fibers are deeply situated, and are more marked just above the anus, where they form a distinct ring, nearly half an inch in width, which is recognized as the internal sphincter. The submucous layer consists of a layer of quite dense connective tissue in which are situated the blood-vessels, nerves, and lymphatics. Its laxity permits the mucous membrane to glide over it. The mucous membrane is continuous with that of the intestine, although much thicker and more movable than that of the colon, and its great vascularity causes it to have a bright pink, or even red, color.

The mucous membrane is lined with columnar epithelium, and contains a large number of Lieberkühn's follicles, but no villi. The mucous membrane at the anus abruptly changes from the columnar to the pavement epithelium of the skin, which forms the so-called white line.

207. Pelvic Peritoneum.—That portion of the serous lining of the abdominal cavity which is situated within the pelvis, and envelops the pelvic organs, is known as the pelvic peritoneum. Upon examination of a mesial section it will be seen to leave the anterior abdominal wall about three centimeters above the symphysis and be reflected upon the fundus of the bladder. It covers the posterior surface of the bladder to the level of the internal os, and as much of the lateral surface as lies behind the obliterated hypogastric arteries. (Fig. 125.) From the bladder it crosses over to the uterus, the anterior surface, fundus, and entire posterior surface of which it invests. (Fig. 126.) Laterally from the anterior surface it extends outward upon a plane perpendicular to the pelvic brim, and is attached to the lateral wall of the cavity, thus forming the anterior fold of the broad ligament. The peritoneal investment posteriorly extends over the uterus and upon the upper part of the vagina, nearly three centimeters below the uterovaginal junction. The lateral prolongation of this portion forms the posterior border of the broad ligament. The broad ligament contains the round ligament in its anterior fold; the Fallopian tube in its superior border, between the anterior and posterior folds; and its continuation from the termination of the tube is known as the infundibulopelvic ligament, the integrity of which is of importance in maintaining the ovary, and even the uterus, in position. Resting upon and projecting from the posterior fold, when the patient is erect, is the ovary, which is attached to the uterus by the ovarian ligament. The anterior and posterior leaflets of the broad ligament are separated, in addition to the structures named, by considerable loose, vascular, con-

nective tissue, and afford entrance for the ovarian and uterine arteries and nerves, and egress for the veins and lymphatics, while its base is penetrated by the ureter on its way to reach the bladder. From the vagina the peritoneum is reflected backward, to be attached to the anterior surface of the rectum

Fig. 125.—Curved Dotted Line Shows Covering of the Anterior Uterine Wall by Peritoneum.—(*Winter.*)

and to the tissues in front of the sacrum. Above the promontory of the sacrum it is continuous with the posterior abdominal peritoneum.

The reflection of the peritoneum over the uterus and its extension as the broad ligaments upon each side divide the

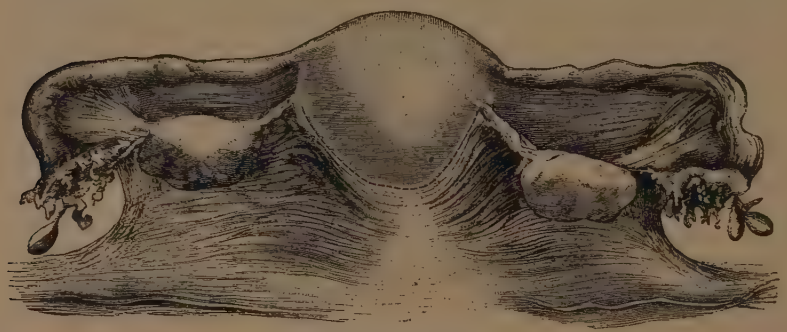


Fig. 126.—Posterior Surface of Uterus Showing Extent of Peritoneum; also Fallopian Tubes, Ovaries, and Ovarian Ligaments.—(*Winter.*)

pelvis into two culdesacs—the anterior, or vesico-uterine, and the posterior, or uterorectal. The posterior culdesac is further divided by a prolongation of muscular structure from the sides of the uterus backward to the ileosacral synchondrosis, over which the peritoneum is reflected. This forms a deep,

cup-shaped cavity directly behind the uterus, which is known as the pouch of Douglas. This pouch dips deeper on the left side, and sometimes extends to the upper border of the perineal body. When the bladder is empty and the nonpregnant uterus lies forward, the coils of small intestine usually occupy this pouch except as its very lowest point, and intra-abdominal pressure sometimes causes its dissection downward until a distinct hernia occurs behind the uterus. On either side, external to the uterosacral ligaments, is a fossa, which is known as the para-uterine pouch. This has been called by Polk the retro-ovarian shelf. On the side wall of the para-uterine pouch

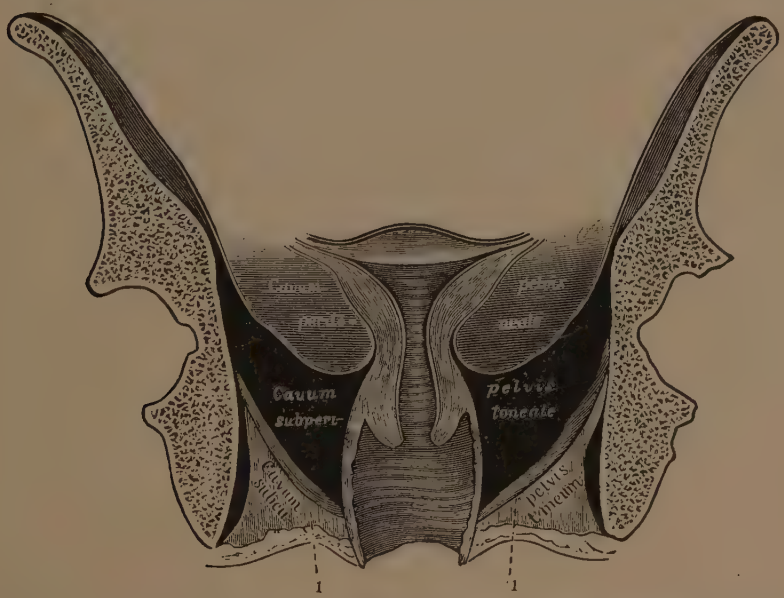


Fig. 127.—Vertical Transverse Section of the Pelvis, Showing Peritoneal Pouches. —(*Luschka.*)

1, 1. Levator ani muscle.

the ureter may be seen beneath the peritoneum. This space is occupied by the small intestine. During pregnancy the para-uterine pouch is lifted up to the pelvic brim, while Douglas' pouch remains unaffected. From before backward, we may find the following pouches or depressions: first, the pubovesical; second, the vesico-abdominal, which is seen only during distention of the bladder, and varies in depth according to the point at which the serous lining of the abdominal wall is reflected. The vesico-uterine pouch is bounded in front by the bladder; posteriorly, by the uterus. This pouch varies less

than the others, on account of the firm attachment of the peritoneum to the anterior surface of the uterus. In the empty bladder the bottom of this pouch is about three centimeters distant from the anterior culdesac of the vagina, and the pouch rises somewhat as the bladder falls. The study of the female peritoneum renders it evident that it differs from that of the male in not being a closed sac, as it communicates with the uterine mucous membrane through the orifice of the Fallopian tubes, and is again perforated by the ovaries, which project through it. The close relation of the peritoneum to the pelvic viscera renders any change in this structure perilous to the normal situation and relation of these organs. Inflammatory changes result in thickening and cicatrization, which produce temporary, if not permanent, displacements. The fixation of the uterus, compression of the ovaries, and obstruction of the orifices of the Fallopian tubes are necessary sequels of such alterations. The peritoneum, according to Luschka, serves as a sort of diaphragm, dividing the pelvic cavity into two portions; the one above may be called within the peritoneal space, and that below, the subperitoneal. In the latter is situated the greater part of the pelvic connective tissue.

208. Pelvic Connective Tissue.—The pelvic connective tissue is a loose cellular tissue, which acts as a padding for the support and safety of the pelvic organs. This structure is continuous with that which exists in other portions of the body. It appears in the pelvis in two varieties: first, as a loose tissue, distributed in an irregular manner around and between organs, and between the layers of the broad ligaments, where it acts as a support to the blood-vessels and folds of the peritoneum; second, as firm, well-defined laminæ or planes entering into the formation of the pelvic floor. These have already been described under the name of pelvic fascia. The connective tissue is continued behind the symphysis as the retropubic fat, and there lies in front of the bladder. Between the base of the bladder and the vagina it is rather firmly connected. On the posterior surface of the vagina there is a very loose layer connecting it with the rectum. A large mass is found on each side of the cervix uteri, forming under the broad ligaments what is known as the parametrium, which is united in front and behind by a much thinner layer. Over the body of the uterus the connective tissue is very slight and contains no fat. The rectum and vagina are embedded in considerable masses of this tissue. From the uterus and the parametrium a thin layer extends between the leaflets of the broad ligament, and serves as a support for the vessels. The chief mass of this tissue is situated around the cervix, and extends downward around the vagina to the insertion of the levator ani muscle.

The distribution and relation of the pelvic connective tissue have been studied in different ways. The most valuable method is by the examination of frozen or spirit-hardened pelves, by which the position of the tissue, its amount, and its distribution are recognized. Injections of air, water, and plaster-of-Paris have been made beneath the pelvic peritoneum in order to determine the lines of cleavage in the pelvic connective tissue and the directions in which pus would be likely to burrow. König made investigations upon the bodies of women who had died shortly after labor from nonpuerperal disease. When an injection is made between the layers of the broad ligament, high up in front of the ovary, it first passes into the tissue at the highest part of the side wall of the true pelvis; then into the iliac fossa, lifting up the peritoneum; follows the course of the psoas, and passes but slightly into the hollow of the iliac bone; finally, it separates the peritoneum from the anterior abdominal wall some little distance above Poupart's ligament, and from the true pelvis below it. Second, when the injection is made beneath the base of the broad ligament and in front of the isthmus, the deep lateral tissue becomes filled first; then the peritoneum is lifted from the anterior part of the cervix uteri. Separation extends to the tissue in the bladder, and ultimately along the round ligament and the inguinal ring, where it separates the peritoneum along the line of Poupart's ligament and enters the iliac fossa. Third, an injection at the posterior part of the base of the broad ligament fills the tissues around Douglas' pouch, and then follows the course as first described.

209. The Vascular Supply.—The pelvic organs and peritoneum are supplied through the ovarian, uterine, vaginal, and internal pudic arteries. The ovarian arteries, analogs of the spermatic in the male, arise from the abdominal aorta just below the renal branches and pass downward over the psoas muscles, beneath the ureters, enter the broad ligaments, and pass to the side of the uterus, near which each divides into two branches. The upper supplies the fundus uteri, and the lower anastomoses at the side of the uterus with the anastomotic branch of the uterine artery. In its course the ovarian artery gives off branches to the ampulla of the Fallopian tube and to the isthmus, and also numerous branches to the ovary. A small branch is given off to the round ligament. The uterine artery springs from the anterior division of the internal iliac, passes downward and inward toward the cervix uteri, then upward between the layers of the broad ligament in a very tortuous course, and anastomoses with the lower branch of the ovarian. This portion is sometimes called the anastomotic branch, or the puerperal branch, as by its tortuous course it permits the vessel to be

straightened out during the enlargement of the uterus in pregnancy. The primary branches given off by the uterine artery are separated from the peritoneum only by a thin layer of muscle-fibers. These give off secondary branches, which penetrate the muscular wall in a direction at right angles to its mucous layer. They anastomose freely and end in capillary loops in the mucous membrane. The vaginal branches spring direct from the anterior trunk of the internal iliac, but sometimes are given off from the uterine or the middle hemorrhoidal. A special branch of the uterine artery to the cervix joins with its fellow of the opposite side to form the circular artery of the cervix, and with the vaginal branches forms the azygos artery of the vagina. Ex-

Fig. 128.—Distribution of the Uterine and Ovarian Vessels.

tensive anastomoses take place between the vessels of the opposite sides. The entrance of the vessels by the broad ligament enables us in extirpation of the uterus to control hemorrhage by ligation of the latter. The anterior division of the internal iliac also affords the blood supply to the bladder and rectum. The perineal region is supplied by branches from the internal pudic artery—a branch of the anterior trunk of the internal iliac. It passes out through the greater sciatic notch and enters through the lesser, passing around the spine of the ischium. In its course it lies upon the internal obturator muscle, and is inclosed with the pudic nerve in a canal formed for it by the

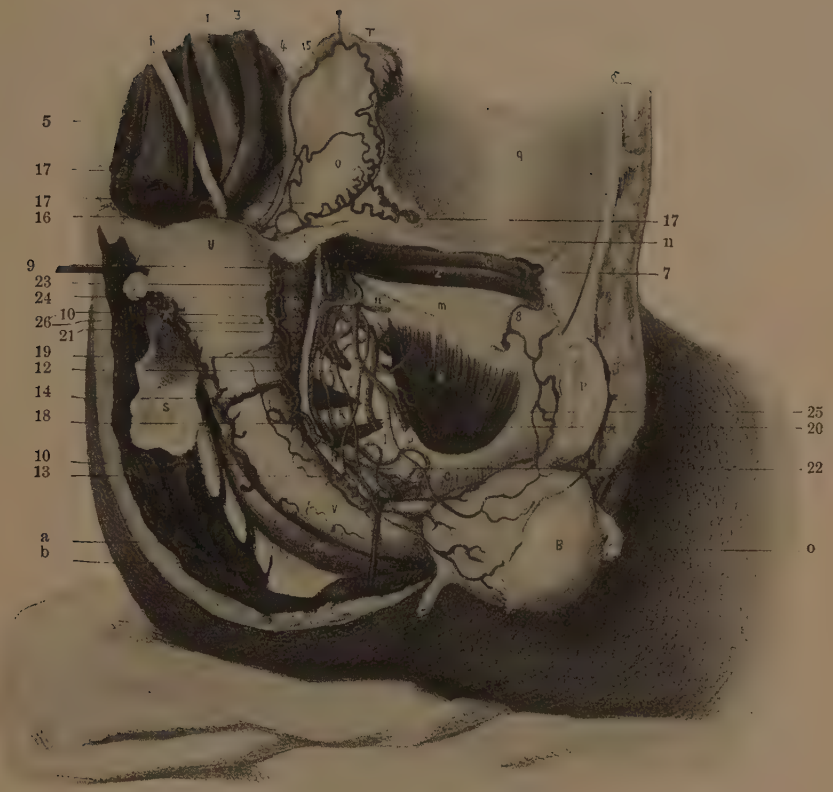


Fig. 129.—Arteries of the Female Pelvic Organs.—(*Savage.*)

1. Vena cava inferior, receives right and left common iliac veins. 2. External iliac vein. 3. Abdominal aorta. 4. Inferior mesenteric artery. 5. Right common iliac artery. 6. External iliac artery. 7. Epigastric artery. 8. Obturator branch of epigastric artery. 9. Internal iliac artery, crossed in front by h, the ureter. 10. Uterine artery. 11. Obturator artery; its course is along with and below m, the obturator nerve. L. Round ligament. 12. Inferior vesical artery. 13. Vaginal branch from it. 14. Uterocervical artery. 15. Artery of the Fallopian tube. 18. Vaginal artery. 17, 17, 17. Spermatic arteries. 19. Pudic artery. 20. Superior vesical artery. 21. Inferior hemorrhoidal artery, joined at 22, another inferior vesical branch. 23. Posterior division of internal iliac artery, terminates in (24) iliolumbar lateral sacral, and (25) gluteal. 26. Sciatic arteries. B. Bladder. O. Urachus. V. Vagina undistended, resting on (R) the rectum. O. Ovary. T. Fallopian tube. 15. Fallopian branch. U. Uterus. L. Round ligament. S. Sacral articular surface of sacro-iliac symphysis. P. Pubic symphysis, articular surface. a. Pyriformis muscle. b. Gluteus maximus muscle. c. Obturatococcygeus muscle. p. Spine of the ischium. f, f. Psoas muscles. g. Linea alba. h, h. Ureters. i, j, k, l. Trunks of sacral nerves resting on the pyriformis muscle. m. Obturator nerve. q. Peritoneum covering the transversalis fascia.

obturator fascia. It gives off the following branches: The inferior hemorrhoidal; the transverse perineal; the superficial perineal or vulvar artery, which is much larger than the corresponding branch in the male—the artery of the bulb; the profundi branch to the crus clitoridis; and the dorsal artery of the clitoris. The round ligament receives a small branch from the epigastric artery, which anastomoses with the branch from the ovarian. The *venous distribution* of the pelvis is very abundant, and occurs

Fig. 130.—Distribution of the Pudic Artery to the Structures of the Perineum. —(*Deaver.*)

in the form of numerous plexuses, which freely communicate with one another. These veins are provided with valves. Consequently hemorrhage from an injured part will be very profuse when the whole pelvic vascular system is engorged, as, for instance, during pregnancy. Dissection discloses a vesical plexus which lies external to the muscular coat of the bladder. At the lower part of the rectum the hemorrhoidal plexus is found

situated beneath the mucous membrane. The distribution of the veins of the labia is similar to that of the arteries. From the superficial portion they drain into the pudic, which communicates with the common iliac vein. The large veins from the labia minora open into the pars intermedia above. The blood returns from the glans and corpus clitoridis through the dorsal vein of the clitoris, which communicates with the vesical

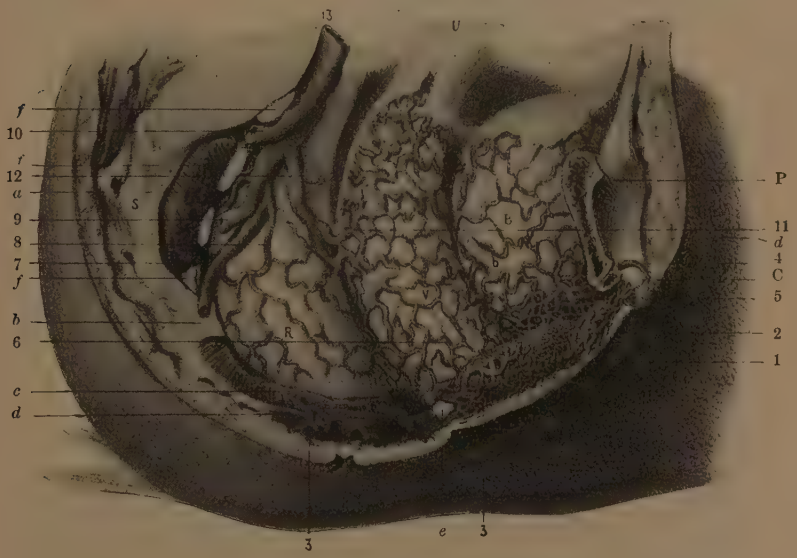


Fig. 131.—Relation of the Urethral and Vaginal Venous Plexuses with the Veins of the Clitoris and Bulb. The Right Side of the Pelvis Removed by a Section in Front, through the Pubic Body, About an Inch from the Symphysis, and, Behind, through Sacro-iliac Joint.—(*Savage.*)

B. Bladder partially inflated, and b (*vis*), ureter cut just before it enters the bladder. V. Vagina distended. P. Section of pubis. R. Rectum. C. Clitoris. S. Sacrum. 1. Bulb. 2. Its urethral venous process. 3. Lower efferent veins. 4. Dorsal vein of the clitoris. 5. Urethral venous plexus. 6. Commencement of vaginal venous plexus. 7, 8, 9, 10. Sciatic and gluteal veins corresponding to arteries. 11. Uterine veins assisting to form the uterovaginal venous plexus. 12. Obturator vein. 13. Internal iliac vein. *a.* Pyriformis muscle. *b.* Larger sciatic ligament. *c.* Pubo-, obturato-, and ischio-coccygeal muscles. *d.* Suspensory ligament of the clitoris. e. Bulbovaginal gland. *f, f, f.* Roots of sacral plexus of nerves.

plexus. The vaginal plexuses are situated, one in the submucous tissue, and the other external to the muscular coat. They communicate with the hemorrhoidal and vesical plexuses, receive the blood from the veins of the bulb, and empty into the internal iliac vein. The uterine plexus is very complex, and empties into the ovarian veins. The right ovarian vein enters the inferior

vena cava; and the left, the left renal vein. The right ovarian vein has a valve where it pierces the coat of the inferior vena cava, while the left has none. To this arrangement is attributed

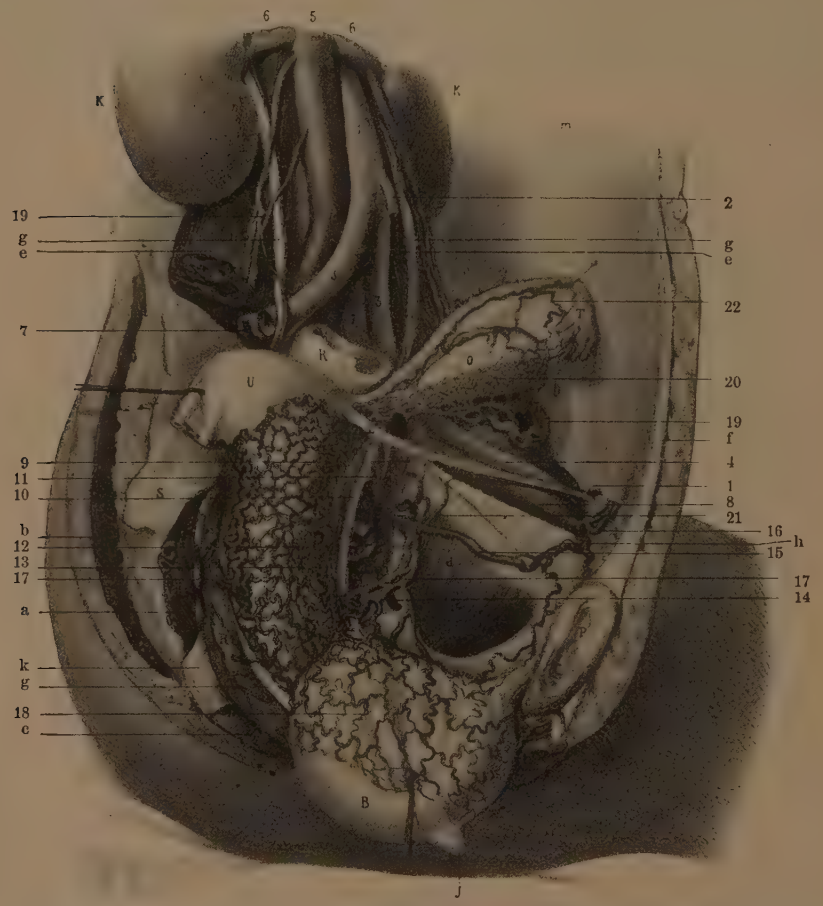


Fig. 132.—Veins and Erectile Venus Plexuses of the Female Pelvis.—(*Savage.*)

B. Bladder. R. Rectum. L. Round ligament. U. Uterus. O. Ovary. V. Vagina. S. Sacro-iliac articulation. K. Kidney. T. Fallopian tube. P. Pubic symphysis. a. Pyriformis muscle. b. Gluteal muscles. c. Ischiococcygeus muscle. d. Internal obturator muscle. e, e. Psoas muscles. f. Linea alba. g, g. Ureters. h. Obturator nerve. i. Internal inguinal ring, site of canal of Nuck. 1. Abdominal aorta. 2. Inferior mesenteric artery. 3, 3. Common iliac arteries. 4. External iliac artery. 5. Vena cava. 6. Renal veins. 7, 7. Common iliac veins. 8. External iliac vein. 9. Internal iliac artery. 10. Gluteal. 11. Iliolumbar. 12. Sciatic. 13. Pudic. 14. Obturator. 15, 16. Epigastric veins. 17. Uterine vein. 16. Vaginovesical venous rete. 19. Spermatic veins. 20. Bulb of the ovary. 21. Vein to round ligament. 22. Fallopian veins.

the greater frequency of pain and disease in the left ovary. The ovarian or pampiniform plexus lies between the folds of the broad ligament and communicates with the uterine plexus. The ovarian plexus opens into the inferior vena cava. At the hilum of the ovary is situated the collection of veins known as the

Fig. 133.—Erectile Organs and Veins of the Female Perineum.—(*Savage.*)
h, g. Crura clitoridis. 1, 2. Bulb of the vagina. 3. Vestibular intercommunicating branches. 5. Superficial perineal and obturator veins. 6. Veins of communication with superficial epigastric veins. 8, 9, 10. Pudic vein and primary branches. M. Urethral orifice or meatus. V. Vaginal aperture. A. Anus. T. Tuberosity of ischium. O. Coccyx. G. Vulvo-vaginal gland.

bulb of the ovary. The vesical, hemorrhoidal, and vaginal plexuses, with the pudic veins, empty into the internal iliac vein, which joins the inferior vena cava. From the hemorrhoidal plexus there is a communication with the portal system through the superior hemorrhoidal vein.

210. The Lymphatic System.—This comprises: first, the lymphatic glands; second, the lymphatic vessels. The lymphatic glands are: (*A*) the inguinal glands, which lie parallel to and just below Poupart's ligament; (*B*) the pelvic glands. (Fig.

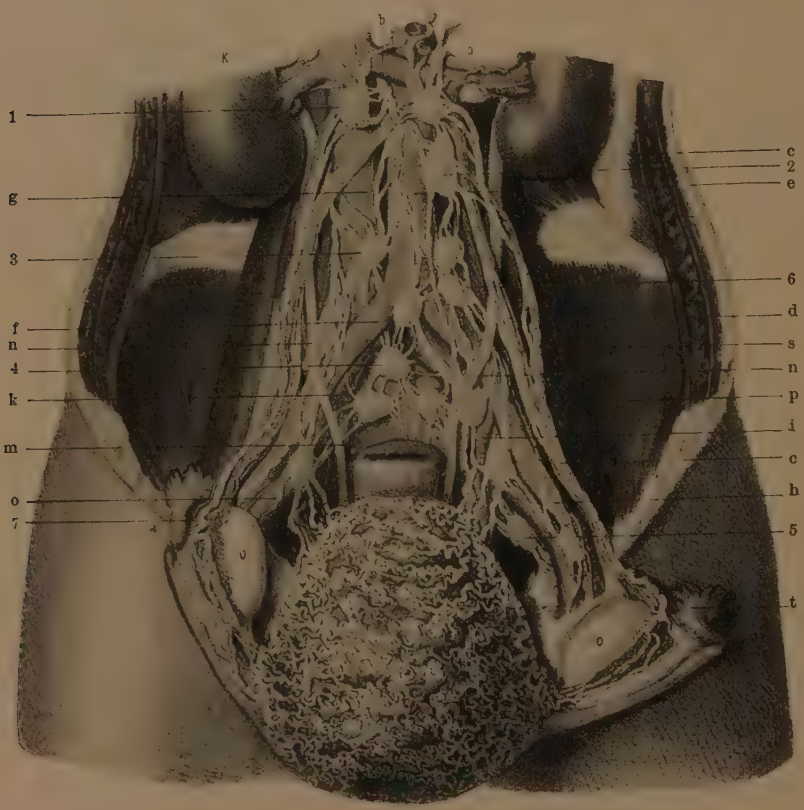


Fig. 134.—The Lumbo-iliac Lymphatics and Glands. Lymphatics of the Gravid Uterus and Appendages.—(*Savage.*)

1, 2. Superior lumbar glands. 3. Inferior lumbar glands. 4. Sacral lymphatic glands. 5. External and internal lymphatic glands. 6. Common iliac glands. 5, 7. Spermatic lymphatic plexus. a. Left renal vessels. b. Left renal vein. c. Left spermatic vein. d. Left spermatic vessels, covered by their lymphatic plexus. e. Aorta. f. Common iliac trunks. g. Ascending cava. h. External iliac artery and vein. m, n. Ureters. o. Right common iliac vein. p. Iliacus muscle. s. Psoas muscle. O. Ovary reversed, showing lymphatics between it and its bulb.

134.) These comprise: (*a*) a gland situated as the isthmus uteri; (*b*) the hypogastric or iliac glands, which lie beneath the peritoneum, in the space between the internal and external iliac vessels; (*c*) the sacral glands, situated on the lateral aspect of the anterior

surface of the sacrum and the mesorectum; (*d*) a gland or small collection of glands at the obturator foramen, known as the obturator gland of Guerin. All these glands discharge into the lumbar glands, which lie in front of the lumbar vertebræ, and finally into the thoracic duct. The lymphatics of the external genitals form an extensive network on the internal aspect of the labia majora, over the labia minora, around the vaginal and urethral orifices, the vestibule, and the clitoris, and all these discharge into the inguinal glands. As a consequence, syphilis or cancer affecting the vulva or lower fourth of the vagina causes involvement of these glands. In the upper three-fourths of the vagina and cervix uteri the lymphatics open into the hypogastric glands. This is true not only of the lymphatics of the upper three-fourths of the vagina and cervix, but also of the lymphatics of the bladder. The lymphatics of the uterus pass through the broad ligaments with those of the ovary and tube and enter the lumbar glands. Some of the uterine lymphatics pass along the round ligaments to the glands of the groin. Leopold, in investigating the lymphatics in the unimpregnated uterus, regards the mucous membrane of the organ as a lymphatic surface consisting of lymph-sinuses covered with endothelium. The lymph passes from these spaces into the vessels of the muscular coat, and flows into the larger vessels which enter the broad ligaments. The distribution of these vessels and their extensive character account for the rapidity with which septic matter is absorbed from the uterine cavity and explain the various routes by which bacteria can pass through lymphatic canals or penetrate the blood-vessels.

The lymphatics of the rectum lie in the mucous and muscular layers and communicate with the glands of the mesorectum or the sacral glands.

Nerves.—The nerves distributed to the pelvic organs are derived from the spinal and sympathetic. The branches from the spinal nerves consist of the inferior hemorrhoidal branch of the pudic from the fourth and fifth sacral, and of the coccygeal nerves. These nerves supply the levator ani, sphincter, and coccygeus muscles; the muscles of the perineum and clitoris are supplied by branches from the internal pudic, which nerve terminates in the nervous plexus of the glans clitoris. (Fig. 135.) The hypogastric plexus, derived from the sympathetic, lies between the common iliac arteries, and distributes branches, which are reinforced by others from the lumbar and sacral ganglia and sacral nerves, to form the inferior hypogastric plexuses, one of which is situated on each side of the vagina. These plexuses distribute filaments to the vagina, uterus, Fallopian tube, and ovary. The pelvic, splanchnic, and hypogastric

nerves are motor and sensory to the bladder; the pudic is motor to the sphincter; and all the nerves of the vagina and clitoris are sensory to the skin of the perineum, and especially so to the

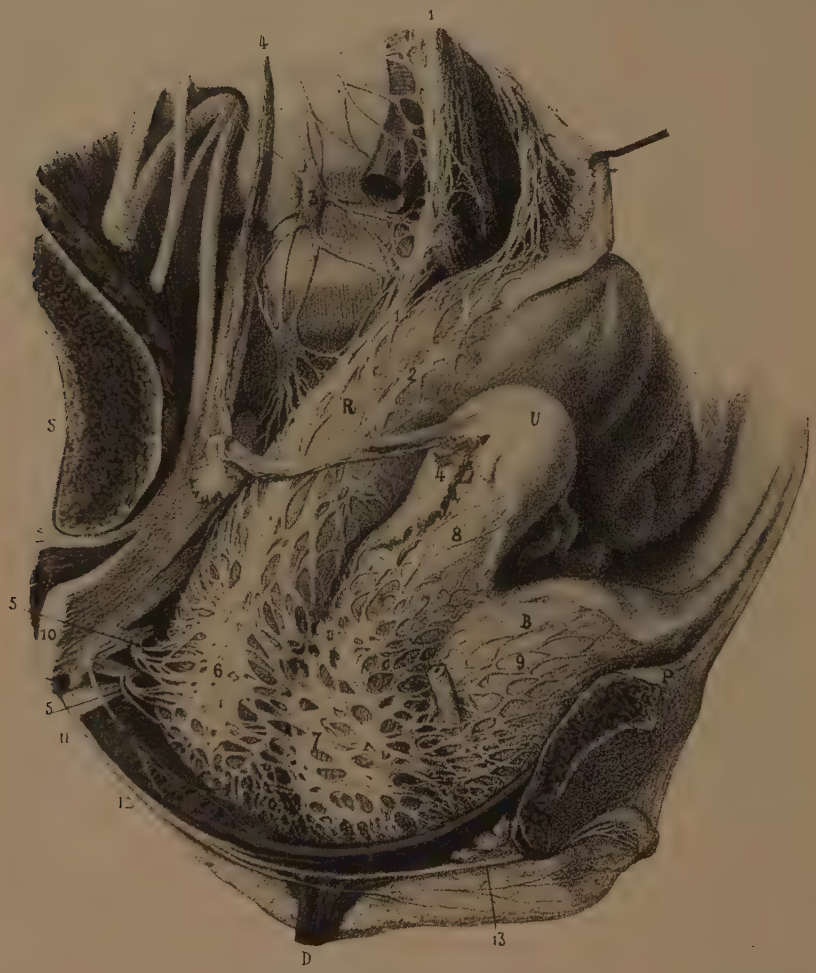


Fig. 135.—Nerves of the Unimpregnated Uterus with the Nerves of the Clitoris. —(*Savage.*)

1. Hypogastric plexus. 2. Rectal branch of inferior mesenteric plexus. 3. A lumbar ganglion of the sympathetc. 4. Spermatic plexus, supplies Fallopian tube, ovary, and part of the uterus. 5. Branches from third and fourth sacral, aiding to form 6, 7, right inferior hypogastric plexus. 8. Uterine filaments. 9. Vesical plexus and branch. 10. Trunk of great sacrosciatic nerve. 11. Muscular branch of the fourth sacral nerve. 12. Trunk of pudic nerve. 13. Continuation of 12 into dorsal nerve of the clitoris. R. Rectum. U. Uterus. B. Bladder. D. Transversus perinei muscle cut across. S. Section of ilium. P. Section of symphysis. .

mucous membrane of the glans clitoris. The terminal filaments in the uterus are found in the nuclei of the unstriped muscle. Those of the mucous membrane are said to end in the ganglia. End-bulbs have been found in the clitoris and vagina. In the ovary the nerves pass to the Graafian follicle and to the walls of the membrana granulosa.

211. Consideration of the Pelvic Organs and Structure Studied as a Whole.—In the upright position the plane of the brim of the pelvis is at an angle of 60 degrees to the horizon. The fundus of the uterus lies just below this plane, with its axis at right angles to it, and consequently at right angles to the vagina, which is parallel to the brim of the pelvis. In the upright position the internal abdominal pressure is directed against the symphysis and the posterior surface of the fundus of the uterus when in its normal situation.

The uterus, as we have seen, is freely movable—swung in its position in the pelvis by the ligaments. The broad ligaments maintain it in the center of the pelvis, and by their position and relation serve to assist in maintaining it in an anteflexed position. The round ligaments are an additional stay, and when of normal resiliency, draw the fundus forward. The other ligaments are the uterovesical and the uterosacral. The former are formed by the reflection of the peritoneum from the bladder to the uterus; the latter, while consisting of folds of peritoneum, also contain muscle-fibers, which are derived from the superior muscular layer of the uterus. The function of the latter filaments is to hold back the cervix, while the intra-abdominal pressure maintains the fundus forward. Deviations from the normal inclination of the pelvis, from the normal resiliency and tone of the ligaments, from the proper relations and support of the vagina, increase in the weight of the uterus, and increased intra-abdominal pressure, are all factors in the production of uterine displacements, especially that form characterized by descent. The plane of the outlet of the pelvis when the patient is erect forms an acute angle in front with the horizon. The urethra, the vagina, and in the upper part of its course the rectum, are parallel to the plane of the brim of the pelvis. The lower portion of the rectum turns acutely backward and forms an axis at right angles to that of the vagina. This portion, the anus, looks backward and downward; consequently, the introduction of the finger or of the nozle of a syringe must be directed forward and upward, or directly toward the vagina, and after passing into the anus, is carried upward and backward. On median vertical section the vagina will be seen to be a mere slit, slightly S-shaped, the lower part of which presents the convex surface

of its posterior wall anteriorly. The pelvic floor is consequently divided into two segments, the anterior and upper of which rests upon the more fixed posterior segment. The rectum at the anus is found to form an anteroposterior slit.

Intra-abdominal force first causes pressure of the anterior segment upon the posterior, and then a sliding backward of that portion of the inferior segment in front of the anterior wall of the rectum.

PHYSIOLOGY.

212. Functions.—The important functions of the genital organs are the processes associated with reproduction. These comprise the alterations in the organs by which menstruation is established, repeated monthly, and finally discontinued; the relation of the sexes in copulation; the fecundation of the ovum, its subsequent nutrition, and the procedure by which the matured product attains a separate existence.

1. The transition from child to woman, indicated by the appearance of menstruation, is denominated *puberty*.

2. The completion of development, which fits the individual for the processes of maternity, is called *nubility*.

3. The deposit of the vitalizing principle of the male within the body of the female occurs through the act of *copulation*, and its union with the ovum is known as *fecundation*.

4. The nutrition of this vitalized structure and its subsequent course of development are recognized as *gestation*.

5. The processes by which the matured product is afforded a separate existence are known as *parturition*.

The first three of these divisions and their variations from the normal comprise the field of gynecology.

213. Puberty.—The completion of the developmental process that results in the establishment of menstruation and ovulation, has been called *puberty*. It marks the transition from the child to the woman, and occurs between the thirteenth and fifteenth years. The age of the individual differs under varying circumstances. Puberty occurs earlier in the natives of hot climates than in those of the north, and earlier in the Latin races than in the Anglo-Saxon. City girls mature at an earlier age than those raised in the country, and those raised in affluence sooner than the poor. The occurrence of the phenomena of menstruation prior to the age of thirteen is called *precocious puberty*. Such instances are not infrequent. Isolated cases occur in which it appears at a very early age. Rein reports the case of a girl of six years whose pubes were covered with hair and who menstruated regularly for a year. The

"New York Medical Record," 16, xi, 1895, presents a report of a girl who gave birth to a child when ten years of age.

Retarded or *delayed puberty* is caused by chlorosis, plethora, or some congenital condition of the genital tract. Numerous cases are recorded where women have given birth to children without the establishment of menstruation; in other words, ovulation occurs without the usual manifestation.

The advent of puberty is manifested by other characteristics than menstruation. The figure becomes more rounded, from an increase of adipose tissue. The breasts enlarge and frequently become painful. Hair grows upon the mons veneris and labia majora. Under this process occurs increased blood formation, the development of glandular structure, particularly in the uterus and the mammary gland, and, especially, marked changes in the nervous system. "There is," Christopher Martin says, "a remarkable transformation in the psychic, emotional, and mental life of the girl. The current of her thoughts is mysteriously changed. Hopes and yearnings unknown before thrill and agitate her, and life acquires a new and deeper meaning. These profound and subtle changes are not so difficult to understand if we accept the view that puberty means the sudden bursting into activity in the midst of the nervous system of a hitherto dormant center."

The glandular development of the mammæ may be so rapid and at times so irregular as to simulate a tumor. The period of life should prevent error.

214. Nubility.—The advent of puberty indicates that the conditions and functions are established that will permit procreation, but the structures are not sufficiently developed to render the individual suited for favorable reproduction. Experience has demonstrated that the mortality is much greater among those who come to the completion of gestation prior to the age of twenty. Women coming to early maternity mature early, reach the menopause at an early age, and are prematurely aged.

215. Menstruation and Ovulation.—Menstruation—also called the menses, the monthlies, the courses, the turns, the sickness, and the periods—has been defined by Sutton as the "periodic discharge of blood from the uterus, accompanied by the shedding of the epithelium of the body and fundus, as well as of that lining the utricular glands near their orifices."

Ovulation is the discharge of an ovum from a matured Graafian follicle. These two processes are considered here in co-relation, though we have no positive proof that they are co-dependent. We have, however, determinative evidence that they are occasionally independent of each other. The not infrequent

occurrence of pregnancy prior to the advent of puberty and subsequent to the climacteric is an indication that ovulation can occur without menstruation. Cases are recorded where a woman has had a number of children without menstruation ever having occurred.

Menstruation, in the majority of women, occurs every twenty-eight days, and the flow lasts from two to eight days. The intervals may vary from twenty-one days to five or six weeks. It does not always occur at an absolutely definite date in the same individual.

The quantity of blood lost is difficult to determine. The average amount is estimated at from three to five ounces. It has been mentioned that the flow varies in duration from two to eight days. A flow shorter than two or longer than eight days in duration indicates an abnormal condition. Absent or greatly decreased flow is known as amenorrhea. The prolonged or excessive flow is called menorrhagia. When the function is associated with severe pain, it is pronounced dysmenorrhea. The menstrual discharge is not pure blood, but consists of blood-corpuscles mixed with mucus and desquamated uterine epithelium. In ordinary conditions it is a bright fluid, but when the flow is excessive or rapid, it comes away in large and dark clots.

The duration of menstrual life is nearly thirty-five years, and, like its advent, the period of final cessation may be advanced or retarded by various causes.

Menstruation occurs only in women and in certain monkeys; it is apparently limited to those animals that maintain the erect position.

The flow is generally preceded by some premonitory symptoms—a sense of weight, pressure, or uneasiness in the pelvis and back, and extending down the limbs. Mental and nervous irritability are frequently marked. Special nervous characteristics are exaggerated during, and especially immediately preceding, the flow. The mental equilibrium is frequently disturbed, and women exhibit delusions during menstruation who are perfectly rational during the intervals. Epilepsy, migraine, and other nervous manifestations are prone to occur or to be exaggerated during or near the period.

During the menstrual process the uterus and pelvic viscera become engorged with blood; the uterus is enlarged, turgid, and sensitive; the capillaries rupture, some upon the surface and others within the mucous membrane. The uterine epithelium becomes desquamated; during the process of engorgement the glands have become filled with epithelium, which is discharged from the external portion of the gland. Many of the cells are liquefied, increasing the quantity of mucus. With the establish-

ment of the flow the engorgement is relieved and the general disturbance subsides. After the termination of the period the mucous surfaces are gradually regenerated from the epithelial tissue remaining in the glands, until at its culmination the process is again renewed. According to Napier, this desquamation and regeneration of the structures from the utricular glands, and the accumulation of glandular products in the uterine glands and the ovaries, stands in a causative relation to menstruation.

It is only when the ovaries and utricular glands attain a

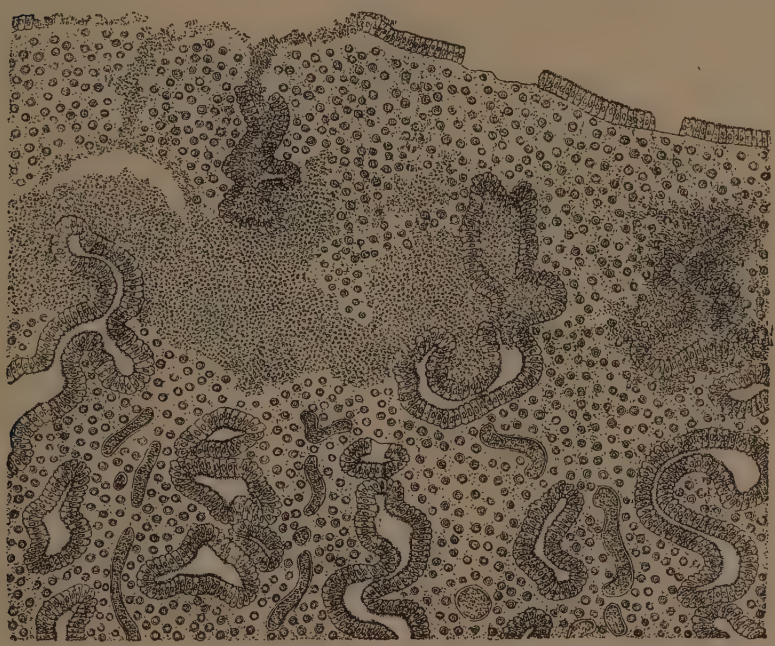


Fig. 136.—Changes of Uterine Mucous Membrane During Menstruation.—(*Wyder.*)

development that renders their secretion capable of exerting a dominating influence upon the general economy that puberty occurs, and the process continues until these structures begin to atrophy and cease to exert their governing course. Napier denies the probability of the period being induced by ovulation, and cites the occurrence of the latter without menstruation, and the continuation of menstruation after the removal of both ovaries, as presumptive evidence. Many other theories are advanced for the periodic occurrence of menstruation. Johnstone believes in a special menstrual nerve plexus, situated

near the cornua of the uterus; but this structure has not been recognized by any other observer.

My observation leads me to doubt that menstruation occurs after the complete removal of ovarian stroma. An occasional discharge of blood does not constitute menstruation. The pressure of the ligature upon the nerves of the ligament will cause a bloody flow a few days subsequent to removal of both ovaries, though the operation had been preceded a few days by the regular menstrual discharge. Doubtless a continued irritation may be a cause for other discharges. The removal of the appendages by the use of the Staffordshire knot or the simple transfixion of the pedicle and its ligation in two portions is prone to leave some of the ovarian stroma upon the stump, and menstruation will recur until the retained stroma is exhausted.

The alteration of the uterine mucosa which occurs during menstruation prepares it for the reception and nutrition of the fecundated ovum. The fact that gestation occurs without an intervening period is no contravention of this supposition, but only a demonstration that the preparation can occasionally occur without the shedding of blood.

The nerve influence leading to the increase of the liquor folliculi, and the liquefaction of the cells of the membrana granulosa, promotes the multiplication of cells in the mucosa, which is followed by menstruation. The coexistence of these processes is seen in the formation of a corpus luteum synchronous with menstruation. The course of menstruation is averted by pregnancy. Menstruation continues during pregnancy only with the rarest exceptions, and the functional activity of the ovaries is suspended during lactation. Neither ovulation nor menstruation is likely to occur during lactation. Many women prolong the period of lactation for the purpose of rendering themselves less susceptible to fruitful coition.

216. Menopause.—The conclusion of menstrual activity is recognized as a critical period in the woman's existence. It is variously denominated the menopause, the climacteric, and the change of life. The menstrual life of the woman lasts, upon an average, nearly thirty-five years, so that the menopause should occur between the forty-seventh and the fiftieth years. Its occurrence may be accelerated or retarded by various causes.

Premature menopause occurs prior to the age of thirty-two, and may be induced by shock, severe illness, prolonged anxiety, overstudy, mental affections, disease of the ovaries,—such as destruction of the ovarian stroma by double ovarian tumors,—sepsis, chronic disease of the appendages, and some forms of metritis.

Early menopause occurs between the ages of thirty-two and forty-two. It occurs early in the virgin, and earlier in blonds than in brunets. Fat women reach the menopause early. A rapid increase in adipose tissue is associated with some cases of premature menopause. Occasionally the menopause occurs at an early age without any assignable cause.

Retarded or Delayed Menopause.—The occurrence of the menopause is distinctly affected by heredity.

It may be delayed by child-bearing, by the presence of uterine growths, and by the presence of malignant degeneration. Robertson reports the case of a woman who ceased to menstruate for twelve months at the age of fifty, when the flow returned and continued until her death at seventy. Saxonia speaks of a nun who had a return of her menstruation at the age of one hundred, which continued regularly until she died three years later.

The term menopause is employed to designate the period of the change. The average duration of the menopause is about two and one-half years. A few fortunate persons continue to menstruate regularly until a certain period, when the flow discontinues, never again to recur. Others continue irregular for six months, when it ceases. Generally a patient will notice that the periods are getting more scant, until finally she misses one or two periods; then menstruation recurs for a while, to again subside, thus continuing irregularly for one or two years. The irregularity may be prolonged over a period of four or five years. While, as a rule, the intervals are longer, the periods may occur more frequently, with intervals of but twenty-one, or even fourteen days.

The flow may be increased, and occasionally hemorrhages occur without any assignable cause.

Excessive or prolonged bleeding should always be a cause of anxiety, and should lead to a careful examination in order to determine its cause. The cause should not be assigned to change of life until careful investigation has eliminated every other source. The occurrence of menstruation is attended with the elimination of certain materials from the blood.

Chemic changes in the blood and tissues are constant, and the elimination of the albuminoids during menstruation is demonstrated by a more marked alteration of the blood following menstruation than the mere blood-loss would produce.

When menstruation is arrested by anemia or pregnancy, we see in the skin marked deposits of pigment and other materials that would be eliminated by its occurrence.

When the menopause occurs suddenly, the retained products produce an intoxication which results in various nervous perversions. It is a very usual occurrence to witness various vaso-

motor disturbances, such as sudden sensations of heat; flushings; waves of blood rolling up to the face, accompanied by a sensation of giddiness, suffocation, or oppression; cold, clammy perspiration; shooting neuralgic pain; headaches; fullness of the vessels of the head and neck; palpitations; gastric irritation; diarrhea; irritability of temper; melancholia; and disturbed mental balance.

In sudden production of the climacteric after radical operations the vasomotor disturbances are frequently so distressing as to render the condition for which the operation was performed preferable.

Treatment.—The more distressing vasomotor disturbances can be ameliorated by the employment of tonics, good food, rest, massage, and the application of the galvanic and Faradic currents; the administration of the bromids, asafetida, and other nerve sedatives; the regulation of the bowels; and the promotion of digestion.

Picrotoxin in $\frac{1}{80}$-grain doses three times daily seems to exert a specific influence in some cases.

217. Copulation is that act of union of individuals of the two sexes by which the vitalizing principle of the male is deposited in the genital organs of the female. The sexual desire of the woman is much less marked than that of the man. Frequently she has no sexual sensation, and the act is even repugnant, but she yields to the man's embrace from her wish to gratify his desire. Such a woman, mated to a man of impetuous inclination, often becomes a sexual slave. The clitoris and the tissues about the vestibule are erectile, and take part in the orgasm, during which a secretion is ejected from the vulvovaginal glands.

Imperfect or unsatisfactory copulation is a prolific source of disease. Efforts to avoid the legitimate results of copulation, like all violations of nature's laws, visit their penalty upon both the offenders, but most heavily upon the woman.

218. Fecundation.—The union of the spermatozoid with the ovum and the successful fertilization of the latter are known as fecundation. Its occurrence does not require that the woman should share in the pleasurable sensation of copulation; indeed, it can follow in spite of the fiercest resistance upon her part. The spermatozoids, the active fertilizing agent from the man, require no assistance from the woman, but by a vermicular motion can make their way to the ovum in the internal organs.

There has been much discussion over the probable point at which fertilization occurs and as to the ability of the spermatozoa to penetrate the narrow isthmus of the Fallopian tube against the waving cilia, the function of which is to pro-

mote a current toward the uterus. The demonstration that they do overcome these obstacles in the sheep and other lower animals, and are found swarming over the ovary, and the frequent occurrence of ectopic gestation in the woman, should be accepted as a sufficient demonstration that they make the voyage. It is most probable that fecundation results in the tube, from which the vitalized ovum passes into the uterus, which is prepared for its reception.

Impregnation is more likely to occur during or immediately following menstruation; less likely, immediately preceding the flow; and the woman is least susceptible in the mid-interval.

Independent of organic conditions, there is a marked difference between individuals as regards their susceptibility to impregnation.

MALFORMATIONS.

219. Classification; Definition.—A genital malformation is any deviation from the normal form and structure of the female reproductive organs. As the processes of development are not completed until puberty, such deviations may arise from the arrest or distortion of growth at any one of the periods we have already considered in the study of the formation of these organs. As the majority of instances of abnormality are due to prenatal causes, they are justly considered, therefore, as congenital. In the former edition I considered the various lesions of parturition under the head of acquired malformations, but will now discuss them under the designation of traumatisms.

220. Bifidities.—The development of the uterus and vagina from the coalescence of the two Müllerian ducts naturally leads, upon arrest or faulty continuation of the process, to a partial or a complete separation of these organs into two canals. Such a bifid development may be either equal or unequal. This double development may result in the formation of two canals by a simple partition or septum through what seems one body, or a partial or complete separation into two bodies.

221. The Degrees of Division.—The most frequent form of malformation is the presence of a more or less complete septum between the two sides of the uterus and vagina. This partition or septum in the uterus may, according to its extent, consist of five degrees. The first (I, Fig. 137) will present a mere outline which projects from the fundus. Such a condition is rarely recognized during life, unless opportunity is afforded for digital exploration of the uterine cavity. In the *second degree* (II, Fig. 137) a septum extends through the body

to the internal os. This form can be recognized following delivery or abortion, but otherwise may give no indication of its presence. The occurrence of pregnancy may cause its destruction. In the *third degree* (III, Fig. 137) the body and cervix are divided by the septum into two distinct canals. The *fourth degree* (IV, Fig. 137) affords a septum, which is incomplete only in the vagina, and the fifth (V, Figs. 137 and 145) presents a complete uterovaginal septum, forming two canals. The one canal may be readily overlooked, or coition may occur in either side indifferently.

222. Double Uterus.—The division of the organ into two

Fig. 137.—Degrees of Division of the Genital Tract.

Fig. 138.—Uterus Bicornis.

portions may be more or less complete, and consequently may form three classes:

First, the division of the fundus by a groove and two lobes, known as the uterus bilobularis, uterus bicornis arcuatus, or uterus bicornis unicollis (Fig. 138), the latter especially when but one cervical canal exists (Fig. 139).

Second, the body divided into two distinct portions, the double uterus bicornis (Barnes), uterus bifidus; it may have a single or two cervical canals (Fig. 140).

Third, two separate organs exist, each with one tube and ovary, uterus didelphys (Fig. 141). The bodies diverge, each

half being held to the corresponding side by the short broad ligament.

Fig. 139.—Uterus Bicornis Unicollis.

Fig. 140.—Uterus Bifida.

223. Unequal Development of the Two Sides.—The two canals of Müller may be incompletely developed, and thus

produce asymmetric organs of varying form. The one canal may be completely atrophied, while the other presents a well-

Fig. 141.—Uterus Didelphys.

developed horn—the uterus unicornis (Fig. 142). Generally, the absence of one horn is associated with absence of the corresponding tube and ovary. The horn may be rudimentary

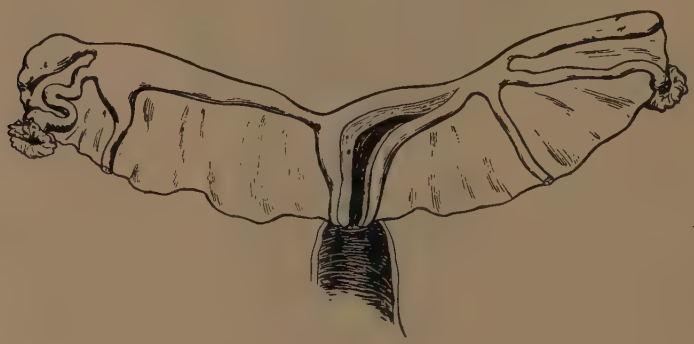


Fig. 142.—Uterus Unicornis.

or partly developed, permitting the occurrence of menstruation and even pregnancy. Such a horn is not prepared for the maintenance of the fecundated ovum to the completion of

gestation, and will result in rupture prior to the sixth month. The occurrence of such a pregnancy is quite as dangerous to life as a tubal gestation, from which it can not, previous to operation, be differentiated. *Atresia* in the canal of a rudimentary or partly developed horn may exist, and lead to an accumulation of the menstrual secretion and the formation of a tumor (Fig. 143). The diagnosis of such a condition is exceedingly difficult, and can be determined only during an operative procedure. The accumulation may rupture into the vagina, but usually at such a height as to leave a portion of the sac dependent and undrained, and, therefore, likely to become infected and lead to septicemia. When the condition is recognized, the treatment should be that for retained menstruation, which will be described later. The development of a one-horned uterus may be associated with a double cervical canal, — *uterus biforis*, — a condition which may cause embarrassment during labor. The septum when discovered may be pushed to one side, or, if necessary, be cut between two sutures (Pozzi). When torn, it has caused severe hemorrhage.

Fig. 143.—Atresia of Rudimentary Horn with an Accumulation of Menstrual Blood.

224. Absent Uterus.—Entire absence of the uterus is rare, and is almost always associated with absence of the other genital organs, particularly of the vagina. The determination of the condition is difficult.

The introduction of the index-finger of one hand into the rectum, and that of the other or of a catheter into the bladder, enables the operator to thoroughly explore the pelvis. Failure to recognize the organ may be due to its rudimentary condition or its displacement to one side, and we can assert its entire absence only when we have been able to explore the pelvis through an abdominal incision or during an autopsy.

225. A rudimentary uterus may exist in the form of a slight

thickening over the surface of the bladder, as two undeveloped canals in the form of a T,—the *uterus bipartitus* (Fig. 144),—when the vagina is frequently absent or may be partly developed, deepened by coition, or may exist as a small culdesac continuous with the urethra, which has been dilated by repeated efforts at coition. Menstruation is generally absent; ovulation may occur without molimina, or there may be the occurrence of hematometra.

When the vagina is well developed and menstruation occurs, the condition may remain undiscovered. The rudimentary character of the organ can be determined by bimanual palpation or by palpation through the rectum and the bladder, as has been described. The occurrence of painful molimina may require castration.

Fig. 144.—Uterus Bipartitus or Duplex.

226. Fetal and infantile uteri are instances in which the organ has been arrested during the fifth stage of its development. The uterus is small, the cervix two or three times the length of the body, and an acute anteflexion of the body probably exists.

The infantile uterus differs from the fetal in that the arbor vitæ arrangement of the mucous membrane no longer extends to the fundus. Menstruation rarely occurs, and sexual desire may be absent. The external genitals may be poorly or well developed. The breasts not infrequently are normally developed.

Treatment.—The existence of a malformation is an indication of defective development and presents a condition in which the function of the affected organ must be more or less impaired.

The presence of a septum through the uterus and vagina may be a cause of dyspareunia, due to the diminished size of the vaginal canal. It need not produce distress or danger during gestation, but not infrequently the cervical and vaginal septa may cause dystocia.

The vaginal septum should be cut through its entire length and the edges of each wall sutured to prevent readhesion. The

cervical septum can be crushed by forceps, which should be left in place to produce necrosis of the compressed tissues. Such septa do not generally withstand the first gestation, but are broken down in the course of labor. I have twice seen a bridle of tissue attached to the lower portions of the anterior and posterior vaginal walls, which were without doubt remnants of an originally more complete septum.

The division of the uterus into two equally developed portions does not usually call for treatment. The investigation of a large number of such cases demonstrates that pregnancy has frequently occurred without appearing to produce difficulty in parturition. This necessarily depends upon the development of the separate cornua.

In one patient upon whom hysterectomy was done for interstitial myomata, her history revealed that she had given birth to two children, apparently without any unusual phenomena. The operation disclosed that she had a rudimentary horn upon one side, which had its own cervical canal and opened into a blind pouch for a vagina, which was situated between the existing vagina and the bladder.

Fig. 145.—Uterus Biseptus.

It is my purpose upon the next opportunity to split the adjoining cornua of a partially bifid uterus, and after coapting their edges, suture the surfaces so as to establish one cavity. It may be questioned how such a reconstructed organ will endure the course of a gestation, but if pregnancy can go to full term in one horn of the uterus, the organ thus formed should be more capable of performing its physiologic functions. Where the uterine cornua are unequally developed, the danger is from conception occurring in the rudimentary cornu. The recognition of the existence of such a pregnancy should be considered ample justification for its extirpation by operation. Where both cornua are rudimentary, and the patient suffers from menstrual molimina, the abdomen should be opened, and the ovaries removed. Similar advice is proper when the uterus is absent.

The fetal and infantile uteri frequently present conditions in which the function of menstruation is performed irregularly and attended with severe pain. The probability of the patient becoming pregnant and carrying the fetus to full term is dependent upon the degree of development. Under the stimulation of the marital relation such uteri occasionally increase in size. More frequently the individual complains of irregular and painful menstruation, and is sterile.

227. Congenital prolapsus uteri is an exceedingly rare condition, and is usually associated with other forms of defective development, as spina bifida.

228. Accessory or trifid uteri have been reported. Hollander, in 1894, found a second uterus lying in front of the normal organ, between it and the bladder. It was a simple cervix with two orifices, having neither adnexa nor round ligaments. Depage describes a trifid uterus which probably arose from a diverticulum of one of the ducts of Müller.

229. Absent or Rudimentary Tubes.—Absence of the Fallopian tubes is a rare occurrence, and is associated with a similar condition of the ovaries and uterus. The absence of one tube is of more frequent occurrence; a unicornate uterus is generally found. A rudimentary tube is generally the result of an attack of fetal peritonitis. The tube may be a simple cord and yet have well-developed fimbria. The fimbria may be independent of the openings.

230. Accessory tubal ostia are frequent. Ferraresi found six openings upon one tube, all of which were surrounded by fimbria. These openings are generally near the end, but may occur near the middle of the duct. They are probably due to failure in closure of the groove in the germinal epithelium or to splitting of the Müllerian duct after it has closed.

231. Anomalies in Length.—The normal tube is from ten to twelve centimeters long; in ovarian or broad ligament cysts and in ovarian hernia one tube may be found from sixteen to eighteen centimeters long.

232. Absent or Rudimentary Ovaries.—Absence of ovaries is an exceedingly rare condition, requiring an inspection of the abdominal cavity to confirm the suspicion. Absence of one is less rare, and is associated with a unicornate uterus, and occasionally with absence of the corresponding kidney. The rudimentary state is more frequent, and may be fetal or adult. It may contain no glandular tissue, or the presence of unclosed Pflüger's tubes may lead to a suspicion of a testicle. The condition may be produced by oophoritis or peritonitis during fetal or adult life, or by the twisting of a pedicle.

233. Supernumerary ovaries are very rare. Von Winckel

found a third ovary in front of the uterus. Tufts of ovarian stroma have been described. The occurrence of menstruation, and even of pregnancy, after the supposed removal of both ovaries has been reported, but it is more probable that in all such cases there has been failure to remove the entire structure of both glands.

234. Accessory or constricted ovaries are more frequent. A portion of the ovary may depend from the main body by a more or less well-marked pedicle; as many as two or three have been found associated with one ovary.

235. Displacements.—The descent of the ovary may have occurred, and the organ may be situated above the brim of the pelvis. The presence of the ovary in the sac of a hernia is a lesion often difficult of accurate recognition and productive of serious distress.

236. Defects of Round or Broad Ligaments.—Absence of the round ligament is generally associated with absence of uterus in whole or in part. I saw one patient in whom the muscular structure of the round ligament was completely absent. The fold of the broad ligament, in which the round ligament would lie, presented a thin, corrugated margin. The persistence of the canal of Nuck results in the formation of a hydrocele, which may attain to considerable size in the labia majora. The broad ligaments may be absent, extremely short, or unequal in length and thickness. They may contain cysts, which are relics of the parovarium.

237. Complete Absence or Rudimentary Development of the Vagina.—In complete absence of the canal no trace of vaginal tissue will be found between the rectum and the bladder. These two organs lie in contact, with connective tissue only intervening (Fig. 146). In the rudimentary vagina a fibrous cord may exist, indicating the site of the ducts of Müller, the development of which has been arrested in an early stage of fetal life. We may have a complete absence of one of the segments of the vaginal canal, with an incomplete development of the other. In these cases of absent or rudimentary vagina the uterus is generally entirely absent or is reduced to a rudimentary nodule. In some patients normal ovaries are present without any manifestation of menstrual molimina. Occasionally, there are periodic pains at the times of ovulation. Cases have been reported of vicarious hemorrhages from different portions of the body, associated with extreme pains at the supposed menstrual periods, when a well-formed uterus was present. The vulva may also be absent, but is more frequently well formed, presenting a funnel-shaped depression behind well-developed nymphæ. The hymen may be perfectly normal

and the urethra at times may be dilated by the efforts that have been made to effect coition. It is difficult to determine why it should be the lower portion of the vagina that most frequently exists in cases of arrested development. It is probably due to an abnormal elongation of the vestibular canal. This pouch, in the absence of the vagina and uterus, has been found to be two or three centimeters in length and sufficiently wide to admit the finger. These dimensions are very considerably increased by sexual efforts. The opening is generally closed by a pearly, reticulated membrane with a cicatricial appearance. The central portion of the vagina may be absent, or the two portions may be separated by a membrane of variable thickness, which at times is perforated. One patient came under my observation in whom there was a membrane dividing the upper and lower halves of the vagina, and a small opening situated at one side, which permitted the menstrual discharge to escape. The incision of this membrane exposed a good-sized cavity above, and by cutting out a portion of this septum, the two mucous membranes of the upper and lower halves were sutured together, to form a good-sized vagina. In patients with absent vagina the examination should be practised with a finger in the rectum and a catheter or a sound in the bladder. Combined rectal and vesical touch enables us to determine the presence of the uterus and its degree of development.

Fig. 146.—Absent Vagina.

Treatment.—Absence of all or a part of the vagina affords different indications according to the development of the uterus. If the latter organ is normal and the symptoms of menstrual

molimina have existed, with a uterus increased in size, the presence of hematometra should be suspected, and interference should be employed. If there is no uterus, and well-developed ovaries are present, associated with painful sensations, the condition may be considered a sufficient indication for castration. Absent vagina renders the person sexually incompetent, and it becomes a serious question as to whether a vagina shall be established for sexual purposes. The operation for the formation of a vagina was first performed by Amussat. The operation is performed by making an incision through the vulvar surface, using chiefly the fingers in the division of the soft parts, and proceeding step by step with tearing and dissecting combined. The finger of the operator or of an assistant should be kept in the rectum and the sound in the bladder. These organs can be thus readily recognized and their injury avoided. When a depth of from six to eight centimeters has been reached, or the peritoneum opened, the second step of the operation should be performed, which is the investment of the funnel thus established with integument to prevent cicatricial contraction. The skin and mucous membrane of the adjacent parts may be employed for this purpose. When the labia minora exist, they may be split and utilized for the lining of the anterior portion of the canal. (Fig. 147.) After the sutures are applied the cavity is packed with iodoform gauze, and the packing is retained or renewed until cicatrization is complete, when the canal may subsequently be kept open by a glass plug. (Fig. 148.) In some cases attempts have been made to establish cicatrization over a glass plug in the newly created canal, without any attempt to line it with mucous membrane. Such a canal, however, is exceedingly difficult to keep open, because it is liable to contraction even though an obturator is constantly worn. The lining

Fig. 147.—Line of Incision for Formation of Flaps.

1, 2. Flaps from labia minora which are split and used to line the vagina.

of such a canal has been accomplished by following the operation by one upon another patient for redundant vagina, and utilizing the vaginal tissue removed to form a lining membrane for the newly created vagina. The tissue should be sutured over a glass plug (Fig. 149), or, preferably, over the end of a slightly distended bivalve speculum, which is introduced into the canal with the prepared hood of membrane, and as the speculum is withdrawn, some iodoform gauze is lightly packed through it, keeping the membrane in place. During the preparation of the vaginal lining the cavity should be packed with gauze, and the packing introduced with the hood should be removed at the end of a week. If the tissues by this time have united, it should be irrigated, removing any tissue which has not retained its vitality.

Fig. 148.—Flaps outlined in Fig. 147 Sutured in Place, and Denuded Surfaces which Have Furnished Flaps to Line Posterior Wall.

In the patient represented by Figs. 147 and 148, after forming the wall of the anterior portion by splitting the labia minora, I transplanted a flap from the posterior part of each thigh, which fortunately became attached, and a very satisfactory vagina was formed.

The lining membrane can be very much better secured by dissecting up a flap from the inner side of each thigh, which can remain attached to the posterior part of the vulva and thus be more certain of having its nutrition maintained (Fig. 148).

In making the dissection for the vagina, no hesitancy should exist in opening through the peritoneum. By making such an opening the presence and size of a rudimentary uterus are

more readily determined and the latter organ affords a safe point for the fixation of the flaps to line the constructed vagina.

238. Unilateral vagina is due to arrest of development in one of the ducts of Müller, the other forming the vagina. Such a condition may be suspected when the canal is extremely narrow. In cases of double vagina there may be incomplete development of one of the ducts.

Fig. 149.—Sims' Glass Dilator.

239. Double Vagina (Fig. 150).—In this condition the septum divides the entire vagina, when the uterus is also double, or divided. Occasionally, the septum in the uterus does not extend through the external os, while that of the vagina terminates below it. The hymen may have two openings, simulating double vagina. Coition generally occurs through the larger of the two conduits; occasionally it takes place in either one. When the partition of the vagina is partial, the superior portion of the septum will be lacking. When the uterus is double, the upper portion of the vagina is often found to contain the septum, while fusion has been complete below. The septum is usually thick and fleshy, resembling the rectovaginal partition, or it may be very thin, and even perforated in places. Partition of the vagina is not incompatible with normal

Fig. 150.—Double Vagina.—(*Photograph taken from patient of Dr. J. M. Fisher.*)

labor. Dunning has reported cases in which the two vaginæ were separated by a septum that began just above the vulva and extended to the interval between the two small cervices. The separation of the uterus into two parts was demonstrated by the use of the sound. Pregnancy occurred upon the right side, and as the uterus enlarged, the septum disappeared. During labor the vaginal portion was torn from top to bottom and only the lower portion persisted. An incomplete septum may form an obstacle to the passage of the child's head. When it does so, it should be incised. In one patient under my observation there had been a vaginal septum, which was destroyed during a previous labor, and there remained a bridle extending from the anterior wall of the vagina back to the posterior commissure, which hung below the vulva. Twice have I cut through the septum the entire length of the vagina, and sutured the surfaces on each wall, so that a single canal was formed. This course I considered wise, as it decreases the discomfort during coition and removes a cause of dystocia in the event of pregnancy.

240. Atresia of the genital canal is either congenital or acquired. The latter will be discussed farther on in these pages. Congenital atresia may affect any portion of the canal, but is more likely to occur within the vagina or near its orifice at the junction of the vagina and vestibular canal. Next in frequency is the atresia of the internal or external orifices of the cervical canal, although the congenital closure of these orifices is comparatively not nearly so frequent as is the acquired. Vulvar atresia is not uncommon. It is produced by imperforation of the hymen or from agglutination of the labia minora or majora. In the latter there is usually an orifice in front through which the urine and menstrual flow can escape. Such conditions are often unrecognized until after the establishment of puberty, when the occurrence of periodic distress in the pelvis, colic-like pains, sensation of weakness, bearing down, and irritability of temper indicate an effort to establish the menstrual flow. The continuance without discharge, and later the development of a tumor in the median line, should awaken the suspicion of the attendant to the possibility of obstruction to the menstrual discharge and of its accumulation within the genital canal. The mere inspection of the parts discloses the imperforation of the hymen. (Fig. 151.) A tumor will protrude from the vulva; difficulty or abnormal frequency in micturition, more or less obstruction in evacuating the bowels is experienced, and a smooth, purplish surface is seen at the vulvar orifice. If the obstruction is situated in the vaginal canal, the vulvar protrusion will not be so marked.

The introduction of the finger into the canal, however, discloses the accumulation. It is more definitely determined by the finger in the rectum, when the globular tumor encroaching upon that organ is recognized. Pressure over the abdomen causes a sensation of elasticity or indistinct fluctuation. When the vagina is absent the accumulation forms in the upper part of the vaginal canal or within the uterine cavity. An accumulation in the vagina is known as a hematocolpos; in the uterus, as a hematometra; in the Fallopian tube, a hematosalpinx; in both uterus and vagina, a hematocolpometra; and when the distention also involves the tube, it becomes a hematocolpometrasalpinx.

The symptoms are: absent menstruation, although the patient experiences each month discomfort, a sense of fulness, or engorgement in the pelvis with the usual nervous manifestations which awaken the anticipation that menstruation is about to make its appearance. A symmetrical enlargement of the lower abdomen appears, which from its contour has been mistaken by the careless observer for pregnancy. The history of the case with a careful physical examination of the patient should establish the diagnosis. When the obstruction occurs at the internal os with a normal cervix and roomy vagina, the diagnosis becomes more difficult. The mere fact that a girl has never menstruated does not exclude the possibility of pregnancy. In the latter will be found mammary changes, an enlarged and softened cervix, increased vaginal secretion, swelling, and a dusky appearance of the vagina and vulva. In the accumulation of blood these symptoms are absent and the cervix remains small, rather firm and hard. As the accumulation increases the cervix becomes softened, the uterus thinner, forming a thin-walled sac which affords distinct fluctuation.

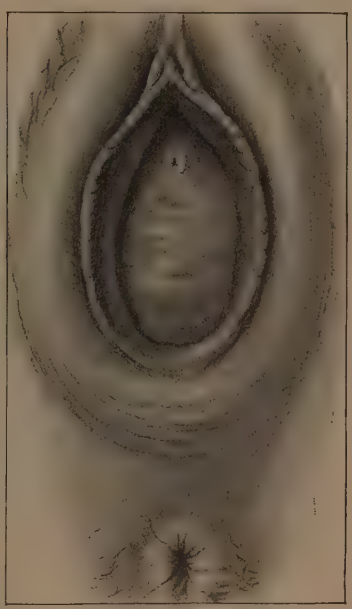


Fig. 151.—Imperforate Hymen.

Treatment.—Operators were formerly very much averse to evacuating the fluid of such a collection. The fluid is thick, chocolate colored, and quite slimy, the latter due, of course, to the retention of the blood and mucous secretions of the canal.

It formerly was advised that a small pinhole orifice should be made through the opening in the hymen, to allow the discharge to continue slowly for several days. Such a procedure almost surely resulted in infection of the material and produced an inflammatory condition of the genital canal, which not infrequently caused the death of the patient. The enormous distention of the tissues renders them extremely anemic, and the removal of the pressure naturally permits an engorgement, which can readily result in inflammation. The most satisfactory method of treatment, however, consists in a free incision to evacuate the contents of the cavity; remove the stringy mucus with the finger and then thoroughly irrigate with a weak antiseptic solution, preferably mild bichlorid solution (1 : 4000) or formalin (1 : 2000 to 1 : 1500). A large quantity of the solution should be employed; the irrigation to be followed by a douche of normal salt solution. Finally the cavity should be lightly packed with iodoform gauze to afford moderate pressure upon the surface, to prevent engorgement, and to give the structures something upon which to contract. When the accumulation occurs above an obliterated or absent vagina, a trocar can be employed to reach the fluid, guided through the intervening structures with a finger in the rectum. The opening made by the trocar is then enlarged to permit a free evacuation and the treatment already advised should be employed. When the accumulation occurs in the uterus from obliteration of the external os, it will often be difficult to determine the site of the latter. The cervix should be exposed, and, if we can not determine the situation of the former os, a puncture should be made with the trocar, which opening should subsequently be enlarged in order to permit the evacuation of the uterine contents. The cavity is then irrigated and packed with gauze. If the obliteration has developed at the

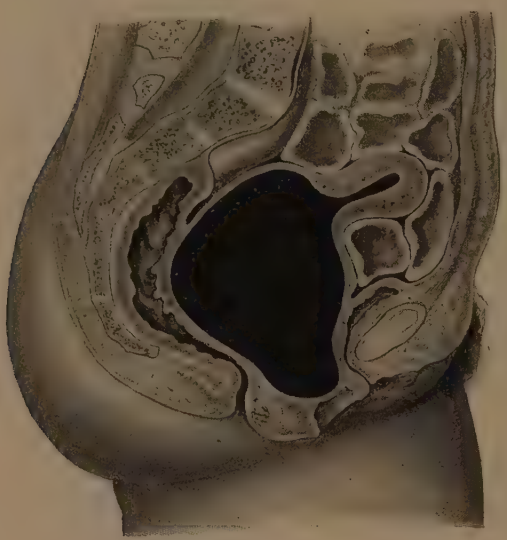


Fig. 152.—Hematocolpos.

internal os, the remaining cervical canal affords a passage through which the puncture can be safely made. The canal having been dilated, and the cavity thoroughly irrigated, the latter should be lightly packed with gauze.

The one element of danger in these operations occurs when the Fallopian tube is distended with an accumulation and is fixed by extensive adhesions. The dragging upon the thin tube which occurs from the contraction of the empty uterus may cause its rupture and the escape of its contents into the peritoneal cavity. Extreme care should be exercised in a hematosalpinx not to make much pressure upon the abdominal surface while the sac is being emptied. Whenever the sac has disappeared with insufficient discharge from the uterus, or when it has disappeared before the opening into the collection has occurred, an immediate abdominal incision should be made to cleanse the peritoneum and remove the offending sac.

Fig. 153.—Hematometra.

241. Lateral Atresia.—Atresia may take place in one-half of a divided vagina or uterus. When it occurs in a portion of the vagina, a lateral tumor will project into the vaginal canal, which will be so elastic and obscure as to render doubtful the fact whether it is a pelvic cyst or a lateral hematocolpos. Such cases are less dangerous than atresia of the entire half of the vagina, as the accumulation will probably rupture into and discharge through the existing vagina. The opening, however, will be high, permitting serious symptoms from infection and the development of a pyocolpos. It is generally advised to make a free incision and pack such a cavity with iodoform gauze, but I much prefer to excise a large section of the wall and unite the mucous surfaces of its cut edges so that the two chambers become one. When the atresia has occurred in one-half of the uterus, the diagnosis is difficult. It is not always situated to one side of the developed horn, but may curve about

it. The accumulation may then be accessible through the vagina, or may be exceedingly difficult to reach. When accessible, it should be opened through the vagina. When inaccessible below, the tumor should be removed by an abdominal incision, as for pyosalpinx.

242. Absence of the vulva is generally associated with a similar condition of the vagina and uterus, although this defect may exist with a normal development of the other genital organs. It then probably results from coalescence of the labia majora. The latter are generally absent in exstrophy of the bladder, and may also be found so in other malformations. The nymphæ can be absent and the clitoris so imperfectly

Fig. 154.—Hematocolpometra

developed that the site of the vulva presents a mere slit or flattened surface, upon which the urethral orifice opens.

243. Infantile vulva is found in weak, sickly women, who have suffered from prolonged ill health prior to puberty, and is generally associated with an imperfect development of the uterus and tubes. The mons veneris and labia majora will be bereft of, or sparsely covered with, hair.

244. Defects in Nymphæ.—Absence of the nymphæ is infrequent, and is accompanied by incomplete development of the clitoris. More frequently they are thin, flabby, elongated, and pointed. Occasionally they are perforated by small openings. *Hypertrophy* of the nymphæ is much more frequent. The nymphæ project beyond the labia majora; in the Bush-

women of Africa they form large folds, which reach nearly to the knees, and are known as the Hottentot apron.

245. Defects of the Clitoris.—The clitoris may be so enormously developed as to cause the sex of the individual to be questioned. In exstrophy of the bladder and absence of the symphysis it may be bifid or rudimentary. It is rarely absent. Frequently, from congenital conditions or from neglect of cleanliness, the smegma is retained beneath the prepuce, producing such irritation and adhesions that the glans clitoris is compressed and prevented from attaining its normal size. The adhesions become so firm as to render their separation difficult. The existence of adhesions and the retention of smegma are capable of producing quite as marked nervous phenomena as the analogous condition in the male, some of which are: irritable bladder, nervous disturbances, masturbation, absence of sensation, and convulsions. The occurrence of such symptoms should direct attention to the clitoris as a possible cause.

Fig. 155.—Enlarged Clitoris.

Treatment.—The glans clitoris should be thoroughly exposed by pushing back the prepuce. The adhesions can readily be broken up with a probe or a grooved director. When the prepuce is so long as to form a hood and completely envelop the glans, it should be retracted by removing an elliptic piece of integument about half an inch above the clitoris, with the long diameter of the ellipse parallel to the cleft of the vulva. This denuded portion should be closed by sutures introduced in its long axis. The length of the denudation necessary depends upon the projection of the prepuce. The prepuce may be dissected away and the cut edges sutured so that the glans

subsequently remains exposed. A better procedure is to remove the margin of the prepuce around the glans. The cut edges should then be united with catgut sutures.

246. Defects of the Hymen.—The hymen is composed of tissue analogous to the corpus spongiosum in the male. It partly closes the vaginal orifice, and has upon its superior surface the foldings of the mucous surface of the vagina. It is generally crescentic (Fig. 99), with the concave margin anterior. It can present an annular opening (Fig. 100); two openings, separated by a septum (Fig. 103); or a number of openings (Fig. 104)—the cribriform. It sometimes resembles in appearance the infantile form, when it is infundibuliform (Fig. 102), or its edges may be dentated (Fig. 101) or serrated. Its normal situation is just within the vulva, where it is exposed by separation of the labia. In the colored race its situation is higher. Its opening in the marriageable woman will easily admit the tip of the finger. *Atresia* has been described. (Section 240.) *Supernumerary hymen* have been reported, but these are probably congenital bridles in the vagina. A *congenital absence of the hymen* must be questioned. The hymen is generally a thin membrane, which ruptures during the first coition (Fig. 105) and sloughs away after confinement, leaving as remnants the carunculæ myrtiformes. The laceration may be central posterior, triangular, or stellate. After a single coition the torn surfaces may unite. I have seen two patients in whom the hymen was so firm as to form an actual barrier to coition, requiring incision to render the act possible. Cases are reported where it did not rupture during labor, or offered such an obstacle to delivery as to require incision. Its laceration is not usually attended with bleeding, but occasionally it is, however, followed by severe, and even dangerous, hemorrhage.

Incision is made with bistoury or scissors, while the labia are widely separated. Two posterior lateral incisions are preferable to a single posterior. Hemorrhage, if severe, should be controlled by a vaginal tampon, or, preferably, by a suture.

247. Hermaphroditism is a condition in which there is a real or apparent union of the two sexes in the same individual. *True hermaphoditism* has not been demonstrated in the human species, although a number of cases have been reported. The case represented in figure 156 presents characteristics of the two sexes, but, like other such cases, requires a microscopic examination to demonstrate the presence of both ovaries and testicles in the same individual.

Pseudohermaphroditism is a condition in which there is such an apparent union of the sexual organs of the two sexes, or such a malformation, or defective development of the male

organs or excessive development of those of the female, as to render the determination of the sex of the individual during life difficult, if not almost impossible. Pseudohermapdroditism

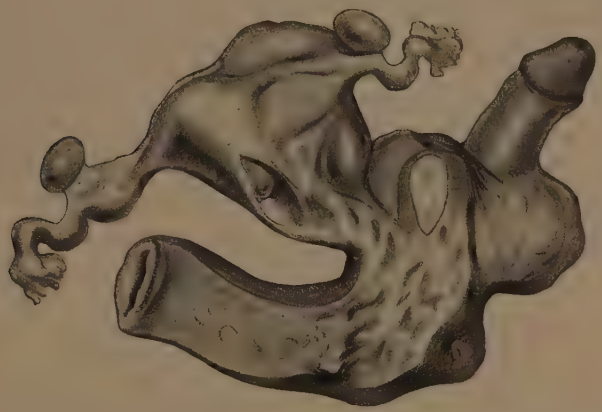


Fig. 156.—Apparent Hermaphroditism.—("*American Journal of Obstetrics.*")

is divided into masculine and feminine, according to the presence of testicles or ovaries. The females resembling men form a class known as the gynandria, while the man resembling the female is classed as an androgynus.

Fig. 157.—External Genital Organs of Madame Le Fort.—(*Auvard.*)

248. Gynandria.—The external organs of the female resemble those of the male. The clitoris is large, with possible

fusion of the labia majora, not infrequently of the labia minora, simulating the scrotum and concealing the vulvar opening. This resemblance is still more striking when there is associated an ovarian hernia into the labium majus. The internal organs may be irregularly developed. The hypertrophy of the clitoris does not necessarily change its form, and may arise in women who are addicted to masturbation. The labial fusion may be so firm as to require incision.

An example of this class is Madeline Le Fort (Auvard) (Fig. 157), who was declared to be a female by Beclard, when

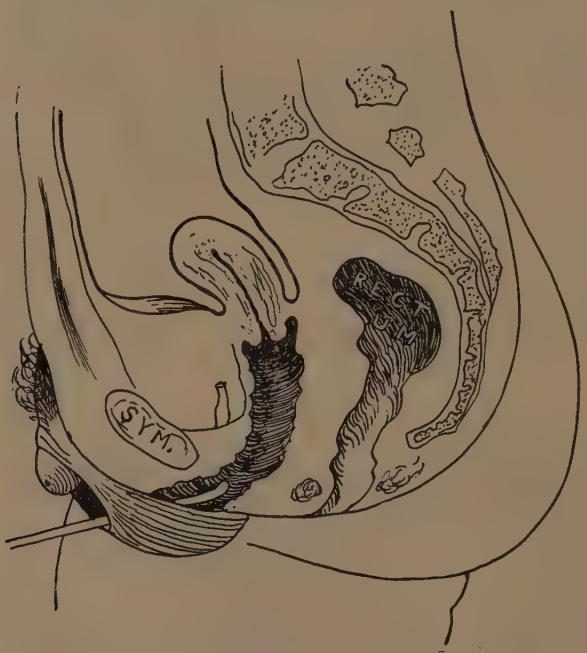


Fig. 158.—Outline of Internal Organs of Madame Le Fort.—(*Auvard.*)

she was six years of age. The clitoris was very large; a groove upon the under surface led to a depressed urethra in the cleft of the vulva. The vagina was replaced by a small conduit, from eight to ten centimeters long, bordering upon a well-formed uterus (Fig. 158). Menstruation occurred at the eighth year, and escaped from an orifice situated at the root of the clitoris. Her general appearance was strongly masculine, and she was sexually indifferent.

249. Androgyna.—This class predominates, and its individuals are frequently monorchid or cryptorchid males, presenting ex-

ternal characteristics of the female, such as enlarged breasts. The penis may be perfect, but the nondescent of the testicles and a median depression in the scrotum resembling the labia majora will give a distinctly feminine aspect. Arrested development of the penis, hypospadias, and fissure of the scrotum greatly increase the resemblance (Fig. 159). Such persons are generally dressed, reared, and educated as girls, and have been married without being aware of their true sex.

The determination of sex is of great importance. It requires careful consideration of the size, shape, and general configuration of the body. The testicle may be small, and be retained within the abdominal cavity. The secretion of the semen is generally sterile. The breasts resemble the feminine, as do also the buttocks and thighs. The larnyx is not prominent and the beard is scanty or absent. The rectal touch, with the catheter in the bladder, may fail to reveal either uterus or prostate. The mental condition is generally feeble or poorly balanced. When careful examination fails to render the sex certain, the individual should be classed as a male. Independent of increased freedom and larger opportunities for acquiring a livelihood, the imperfect male is less likely to enter upon the marriage relation.

Fig. 159.—Androgyna.—(*Pozzi.*)

250. Atresia of the urethra and vagina has been noted, but a fetus with this condition is nonviable.

251. Hypospadias is much more rare in the female than in the male. The vestibule is absent and the orifice of the urethra is not visible to inspection. Generally, the apparent hypospadias is really a persistence of the urogenital sinus. The urethra can be wholly absent, and the bladder may present a crescentic opening into the vagina. It is often associated with prolapse of the bladder-wall, and incontinence is usually present.

252. Epispadias is still more rare. It presents four varieties: (1) The corpora spongiosa are separated, and the urinary sinus is situated in the posterior surface of the clitoris; (2) added to the former condition, there is a partial defect of the anterior urethral wall; (3) the anterior wall of the urethra is entirely absent, the clitoris is bifid, and the labium minus is attached on either side to a portion of the glans clitoris, while the pubic symphysis may also be defective; (4) exstrophy of the bladder,

in which the anterior wall of the abdomen, with that of the bladder, is absent and the posterior vesical wall protrudes. The ureters open upon the surface, and the parts are constantly soiled with urine.

The first form of epispadias is very rare, the last most fre-

Fig. 160.—Imperforate Anus. Communication between Rectum and Vagina.

Fig. 161.—Congenital Defect of Vagina. Communication with the Rectum.

quent. While vesical ectopia is prone to result in disease and obstruction of the ureters, which lead to hydronephrosis and early death, nevertheless histories of patients have been reported who have reached old age. The occurrence of epi-

spadias and associated incontinence is not inimical to the occurrence of conception, and cases of pregnancy at full term are recorded.

Treatment.—The urethra may be established by denuding and suturing the surfaces, but failure to secure a good result is frequent. Ectopia of the bladder is difficult of correction.

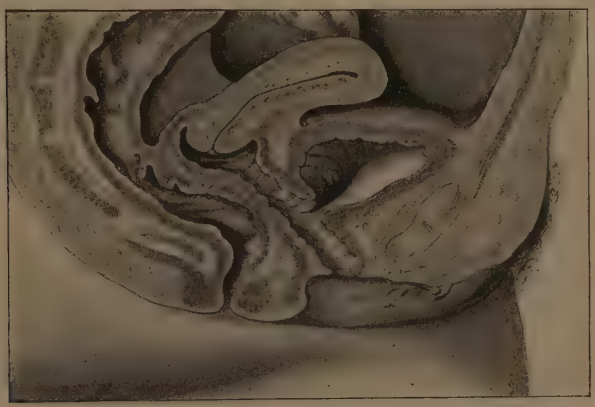


Fig. 162.—Congenital Absence of the Urethra. Communication of Bladder with the Vagina.

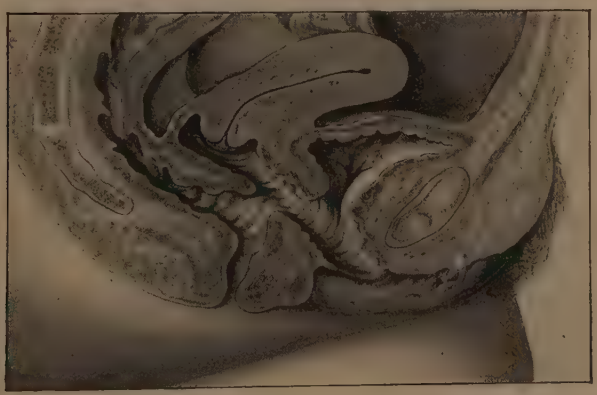


Fig. 163.—Communication of Rectum and Bladder with the Vagina.

It is preferable not to attempt an operation during infancy, owing to the friability of the tissues and the probability of sutures cutting through. Transplantation of the ureters into the rectum probably affords the most satisfactory solution of the problem.

253. Duplication of the bladder has been found associated with doubling of the genitalia.

254. Open Urachus.—Permeability of the urachus and discharge of urine from the umbilicus is a result of congenital closure of the urethra, but sometimes occurs independently. It is much more frequent in boys than in girls.

255. Irregular Exit of Ureter.—Opening of the ureter into the vagina has been described, but these are probably cases in which the supposed vagina is really a rudimentary bladder. I had an opportunity to examine a young woman in whom the bladder was rudimentary and the vagina formed a receptacle in which urine accumulated and prevented incontinence becoming complete. Baum describes an accessory ureter which opened at the side of the urethra. He operated by making an incision above the symphysis, cutting through the bladder upon the

Fig. 164.—Suprapubic Opening of Vagina and Urethra.

ureter, which he divided, tying the distal end, while the other was brought into the bladder. The procedure overcame the incontinence.

256. Abnormal Communications.—Errors in development may produce imperforation of one of the canals which perforate the pelvic fascia or result in the union of two or three of them. In any case the cause is analogous: *i. e.*, failure to accomplish the union between the superficial and deep organs. Imperforations of the anus and urethra are vital, calling for prompt attention of the surgeon. Imperforation of the vagina has been considered. (Section 237.) The communications may be:

1. Rectovaginal. (Fig. 160.) The vagina and urethra are normally developed. The anus is imperforate and, therefore,

the fecal material is discharged by a rectovaginal opening through the vagina.

2. Vaginorectal. (Fig. 161.) The rectum and urethra are normally developed, excepting the opening into the former from the incomplete vagina.

3. Vesicovaginal. (Fig. 162.) The rectum and vagina are normal in appearance, but the urine escapes through the latter, the urethra being absent.

4. Rectovaginovesical. (Fig. 163.) The rectum and bladder both communicate with the vagina. The urethra is generally absent. The anus may or may not be perforate.

5. Suprapubic opening of vagina and urethra. (Fig. 164.) This condition is extremely rare.

TRAUMATISMS.

257. Injuries of the genital organs of sufficient gravity to produce temporary or permanent structural changes, to influence the subsequent health and comfort of the patient, are for the most part limited to lesions of the vulva, vagina, and cervix.

The causes productive of such conditions may usually be assigned to one of three general classes, viz.:

1. External violence.
2. Coition.
3. Parturition.

258. External Violence.—The cases of injury from external violence are comparatively infrequent.

They occur in a variety of ways.

A woman standing upon a chair or step-ladder falls astride the back, or upon the post or round of the chair.

Bovée reports the case-history of a young girl who fell from her bicycle upon the lamp bracket and sustained a complete laceration of the perineum. Lacerations may be produced by sliding down bannisters and striking against the newel post, by sliding from a haystack or haymow, falling upon the handle or prong of a fork or upon a hay-knife. Howe mentions a young woman who thus slid upon the handle of a fork, which entered the vagina and punctured the abdominal cavity twenty-two inches, and from which she ultimately recovered. Curran cites the case of a patient in whom the horn of a goat entered the anus and tore through the vagina. Girls have been impaled upon barrel staves, fence palings, or the sharp stump of a sapling. A chamber or slop jar breaking under the patient has been the cause of injury. The fracture of a

glass-ball pessary in the efforts for its removal has produced vaginal laceration and even fistula. Royster reports two cases of complete laceration of the perineum in young girls, which were caused by the finger of the obstetrician while they were yet within the body of the mother. The injury may be a free incision, a ragged laceration, or a severe contusion. The incision may be produced by striking upon a blunt object, the sharp edge of the rami cutting through the overlying tissues. Large vessels may be ruptured without the skin being broken, when a severe hemorrhage will occur into the tissues. In the former case the hemorrhage will be open; in the latter, concealed.

Treatment.—The injury of vessels and the resulting hemorrhage into the tissues is called pudendal hemorrhage (see Vulvar Hematoma). This may demand evacuation, and the resort to measures for the control of the bleeding vessels.

Severe hemorrhage following an injury should demand an inspection of the injured part and the resort to measures for its control. Where a good-sized vessel is bleeding, the wound, if necessary, should be enlarged and the vessel ligated. Frequently the hemorrhage can be controlled by the sutures which are employed to close the wound. General oozing from a ragged opening is often best controlled by gauze pressure. The wound must be carefully cleansed and maintained in an aseptic condition.

259. Coition, as is well known, causes a rupture of the membrane—the hymen—which guards the vaginal opening. Laceration of this structure is usually central and posterior. It may, however, be bilateral. Occasionally, as has been seen, the hymen is so firm as to resist all attempts at coitus, and, therefore, will require incision before the act can be accomplished.

The entire vaginal canal is more or less dilated by the repetition of the sexual act, as is evidenced by the enlarged and roomy canal which distinguishes the nulliparous from the virgin vagina. Severe lacerations of the vulva and vagina, the result of sexual intercourse, are rare, except when produced by rape of young girls. Instances are reported, however, in which injuries of gravity have been produced, as the pushing off of the hymen, the perforation of the posterior vaginal wall, the rupture of the perineum, the formation of rectovaginal fistula, and perforation of the posterior vaginal fornix. Such injuries are more likely to occur in those who come to the first coitus late in life, or in whom there have been premature atrophic changes. Skrobanski, however, cites a young peasant, aged twenty-two years, in whom the first coitus caused a rupture of the perineum, two centimeters in depth, but without enter-

ing the rectum. R. Abrahams reports the history of a woman, twenty-six years old, in whom a recto-perineal fistula was produced which permitted the introduction of two fingers.

Occasionally the first coitus is followed by a hemorrhage so active as to endanger the life of the woman. The bleeding is best controlled by the introduction of a suture to include the spurting vessel.

Treatment.—Injuries resulting from the sexual act are rarely of sufficient importance to demand surgical interference.

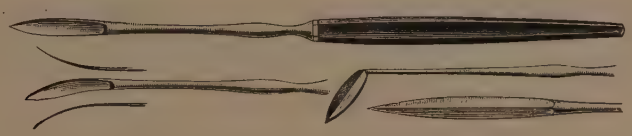


Fig. 165.—Knives for Denudation.

Fig. 166.—Curved Scissors.

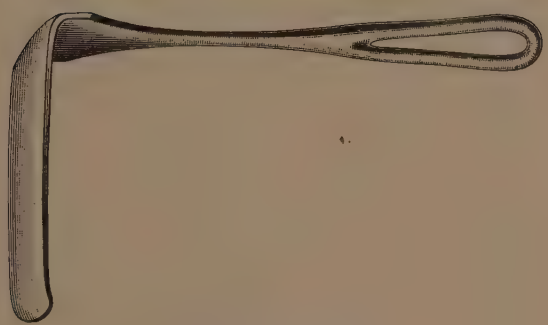


Fig. 167.—Retractor.

If severe, the treatment will depend upon the character and extent of the injury. An extensive laceration should be sutured. The sexual act should be discontinued until the injured parts have fully recovered, and it then should be practised with the utmost gentleness and care.

260. Parturition.—Maternity is not without its penalty. The great majority of the injuries to which the genital organs are subject occur during, or are the result of labor. The in-

juries are due to faulty anatomic conditions, as distorted pelves, rigid, unyielding muscles, inflamed and undilatable cervices, abnormal positions of the fetus, disproportion between its size and that of the pelvis, violent uterine contractions, long-delayed and feeble contractions, the premature or too long postponed instrumental or manual interference.

The long-continued pressure of the fetal head impacted in the pelvis is probably even more disastrous than the premature delivery by the application of forceps. Indeed, vesico-

Fig. 168.—Blunt Hook.

Fig. 169.—Needle-holder.

Fig. 170.—Needles.

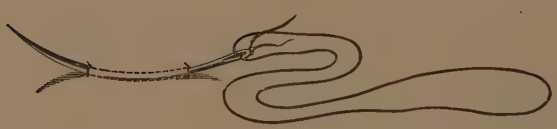


Fig. 171.—Needle with Loop for Suture.

vaginal fistulæ, which were of frequent occurrence prior to the educated use of the forceps, now rarely come under observation. The injuries are of great variety and affect the uterus,—both body and cervix,—the vagina, the vulvar outlet, and particularly the perineum.

261. Injuries of the body of the uterus may occur in the form of lacerations of the anterior or posterior wall, in a vertical or transverse direction, and may be slight or sufficiently large

to permit the escape of the fetus and placenta. After an abortion, the softened uterine wall is occasionally perforated by the curet or placental forceps or both, and through these perforations loops of intestine have entered the uterine cavity, been drawn through the os, and subjected to serious injury. Injuries of this structure are not confined to parturition alone, but the walls of the inflamed or flexed nonpuerperal organ are frequently perforated by the use of the sound or bougie. In removal of fibroid growths, the weakened wall can be ruptured and the tumor projected through it, or the fundus uteri can become inverted and be incised during the removal of the growth.

Treatment.—For the proper course of treatment in rupture of the uterus, during labor, the student is referred to one of the text-books on obstetrics. Perforation of the uterus in the effort to evacuate decomposing placenta or membrane following an abortion should demand careful subsequent observation. In such cases the danger of perforation is so great that the retained fragments should be removed, if possible, by the finger, and placental forceps should only be used with the finger as a guide. Evidence of perforation as presented by bringing a coil of intestine to the os should require careful replacement of the knuckle of the intestine and a certain determination that it has been pushed entirely through the uterine wound, after which the uterus should be packed with iodoform gauze.

Any appearance of shock, disturbance of temperature, or continued and severe irritation of the stomach should be recognized as an urgent indication for abdominal section. Perforation of the uterine wall by sound or bougie, unless associated with infection, has but little significance. Care should be exercised, however, not to irrigate with irritating fluids, and drainage of the uterus should be secured by gauze. The laceration of the uterus during removal of fibroid growths should be considered requisite for immediate suturing of the wound through an abdominal section.

262. Injuries of the cervix uteri are described under the term *laceration.* Laceration of the cervix is the most frequent lesion of labor. It is exceedingly rare for a woman to undergo her first parturition without the cervix being more or less fissured. The tear may vary from a slight fissure, which completely disappears during convalescence, to an extensive laceration, extending to or into the vaginal fornices.

Lacerations of the cervix are unilateral, bilateral, stellate, and through the anterior or posterior lip. The bilateral is the most frequent. The unilateral is more frequently found upon the left side, owing to the greater preponderance of the left occipito-anterior position. Lacerations can occur into the

cellular tissue laterally, or into the bladder in front, and thus cause a vesico-uterine fistula. (See Section 285.) The cicatrization of a lateral tear may produce a band or bridle which tilts the fundus uteri to the opposite side.

263. Symptoms of laceration of the cervix present no special or specific indications of its existence. The symptoms are those produced by the conflicting conditions. The lesion causes subinvolution and a consequent increased weight. A bearing-down sensation, discomfort in standing or walking, and pain in the sacrum and iliac regions are common. The lower level maintained by the organ and the traction of the vaginal wall upon its lips leads to separation of the latter, eversion of the cervical mucous membrane, thickening of the tissue from its exposure, and fixation of the everted lips. Irregular or excessive menstruation, or metrorrhagia, is not

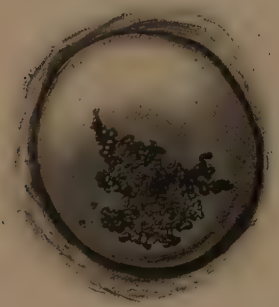


Fig. 172.—Slight Fissure of Cervix.

Fig. 173.—Extensive Laceration of Cervix.—(*Munde.*)

infrequent. Bleeding is excited by locomotion, coition, or sexual excitement. The endometritis causes a profuse leukorrhea, which constitutes a double drain. The cicatricial bands and the everted lips not only permit a depression of the uterus in the pelvis, but produce either lateral version or retroversion, according to the unilateral or bilateral character of the lesion. With cicatrization of the lacerated surfaces, not infrequently the scar tissue in the angles of laceration causes pressure upon the nerves, producing profound neurotic or reflex phenomena. Not infrequently the presence of neurasthenia may be created by pressure of the cicatricial tissue upon the nerve filaments. Pressure with the finger against such indurated tissue aggravates the reflex phenomena.

264. Diagnosis.—A laceration of the cervix is readily recognized by the finger, but its apparent presence must not be

accepted as proof positive of previous pregnancy, for congenital fissure has been recognized, which permits as marked eversion of the lips as is produced by a deep bilateral tear. The finger will also disclose the condition of the lesion, whether it is cica-

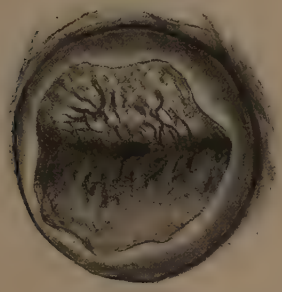


Fig. 174.—Bilateral Laceration of Cervix.—(*Munde.*)

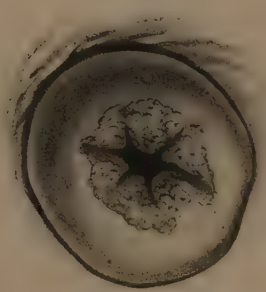


Fig. 175.—Slight Stellate Laceration of Cervix.—(*Munde.*)

trized, the eversion of its lips, the presence of erosion, which is disclosed by its soft, velvety feel, or the existence of eversion of the cervical mucous membrane. Inflammation and obstruction of the glands of Naboth will be disclosed by small, shot-like masses studding the cervix. Passing the finger upward,

Fig. 176.—Extensive Stellate Laceration of Cervix.—(*Munde.*)

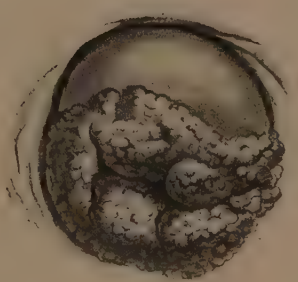


Fig. 177.—Laceration of Cervix with Hypertrophy and Eversion of Cervical Mucous Membrane.—(*Munde.*)

the lips will be found spread out, like the top of a celery stalk, but hard, dense, and fixed.

The bivalve speculum, in drawing upon the anterior vaginal wall, aggravates the eversion. The tubular speculum flattens the surface, removes all trace of the fissure, and leads to the con-

dition being mistaken for granular erosion. The Sims or some retraction speculum affords the best exposure. Seizing each lip with a tenaculum and drawing them together discloses the extent of the tear (Fig. 179). The surface of the tear is covered with exuberant granulations, which bleed upon the slightest touch (Fig. 177), and the profuse discharge renders the differentiation from epithelioma sometimes exceedingly difficult. The diagnosis may be established by the results of treatment.

265. Treatment.—Immediate examination after labor to ascertain the possibility of laceration is undesirable. While the cervix is thin, soft, and relaxed, the lesion can still be recognized. The majority of small lacerations close spontaneously under the employment of ordinary antiseptic precautions. The existence of severe arterial hemorrhage should require an examination to ascertain its source, and when found, is best controlled by suturing the lacerated surfaces. Not every laceration demands an operation, and if not done within the first ten days, three months should pass before is it repaired. Small fissures which are inclined to close or have cicatrized, do not require an operation. When the lesion is complicated with endometritis, the latter should be treated. Operation in slight cases is to be condemned, as it obstructs drainage and may cause the extension of disease to the tubes and pelvic peritoneum. Repair is indicated in deep laceration, in eversion with hypertrophy and cystic degeneration of the mucous membrane, in cicatricial formation at the angles of the fissure producing reflex phenomena, and in subinvolution and endometritis. In addition to slight lacerations, and those which have cicatrized, surgical interference confined to this lesion is contraindicated in tubal or peri-uterine disease.

266. The presence of endometritis, of marked eversion and hypertrophy of the mucous membrane, requires treatment prior to the operation for laceration. The patient's diet should be regulated, constipation corrected, and appropriate measures instituted to relieve the accompanying anemia; a vaginal douche of hot water, containing an ounce of rock salt to the quart, should be frequently employed. The cervix should be scarified or punctured, thus securing depletion. All obstructed Nabothian glands should be punctured and the gland cavity painted with Churchill's tincture of iodin, a combination of tincture of iodin and creasote (2:1), iodin crystals dissolved in 95 per cent. carbolic acid solution, silver nitrate (℥j to f℥j), zinc chlorid (℥j to f℥j), or pyroligneous acid. The superfluous material should be sponged away and a tampon of gauze and cotton applied beneath the uterus. By raising the organ to a higher level the sensation of weight or heaviness is removed and the circulation is improved.

The tampon may consist of plain sterilized gauze and cotton, medicated gauze (iodoform, carbolic or boric acid, or thymolized). Sublimated gauze should not be used, because it causes pruritus. The tampons may be medicated with preparations of glycerin,

℞. Pulv. alum., ... ℥j
Acid. carbolic., ... ℥iv
Glycerin., ... ℥xij

a fifty per cent. solution of boroglycerid, or a ten per cent. solution of ichthyol. In place of the glycerin the tampon can be medicated with an ointment, such as twenty-five per cent. of ichthyol in lanolin. The local treatment, followed by a tampon, should be applied twice a week, and the latter removed at the end of forty-eight hours, to be followed by a vaginal douche of half a gallon of hot salt water (temperature from 110° to 120° F.) twice daily. The douches are preferably given with a fountain (gravity) syringe, while the patient is in a recumbent position on a bed-pan; although in those cases in which the cervix and the neighboring tissues contain a large

Fig. 178.—Blunt and Sharp Curets.

amount of inflammatory exudate the bulb (Davidson) syringe, by force of its current, exercises a salutary influence, by promoting absorption. A profuse discharge of glairy mucus from the surface should be removed with a blunt curet. The curet presses the mucus-collections from the cervical glands and permits the application to come directly in contact with the diseased surface. The medicament may be applied by means of a cotton-wrapped probe, or be carried into the canal with a pipet. (Fig. 82.) Intracervical applications should not be made, however, unless the cervical canal is quite patulous, so that the fluid or increased serous discharge can readily escape. If the canal is obstructed by hypertrophied and everted mucous membrane, gauze packing (Section 82) or the use of a laminaria tent (Section 77) will render the application more effective and safe. Irregular bleeding or profuse leukorrhea should indicate the use of the sharp curet (Section 83), after dilatation (Section 79). The uterus should be irrigated during or following curetment with a disinfectant solution, bichlorid, 1:3000; formalin, 1:1000, a hot soda solution 4 drams to 2 pints, or preferably with normal salt solution, and swabbed with a saturated solution

of iodoform in ether. If for any reason there is much bleeding following the procedure, the uterine canal should be packed with iodoform gauze.

267. Trachelorrhaphy (that is, neck-sewing), or hystero-trachelorrhaphy (that is, womb-neck sewing), is the operation devised by Emmet for the relief of laceration of the cervix. Patient, prepared (Section 119) and anesthetized (Section 127), is placed upon a table in the lithotomy position, with a perineal pad beneath her buttocks to carry the irrigating fluid into a slop-jar at the end of the table. Each leg is held by an assistant or secured by a leg-holder. The following sterile instruments (Section 111) have been placed in a tray upon a table at the operator's right: a scalpel or bistoury; curved scissors; long, rat-toothed dissecting forceps; two double tenacula; a retraction speculum (Edebohls'); six pressure forceps; a needle-holder; four strong needles, curved and bayonet-pointed, each threaded with a loop of silk to serve as a suture carrier. A smaller tray will contain the suture material. My preference for sutures is chromic catgut, which has the advantage that it does not have to be removed (Section 113). The nurse at the operator's left should have charge of the sponges. There should preferably be sterilized gauze, though absorbent cotton wet with sublimate solution, 1 : 2000, can be employed. A fountain syringe, filled with hot normal salt solution or some disinfecting fluid, should be suspended, so that the field of operation can be subjected to constant irrigation. The final preparation of the patient (Section 119) completed, the cervix is exposed with a speculum, and each lip so seized with a double tenaculum as to turn in the everted edges when the lips are apposed. (Fig. 179.) The assistant upon the operator's left holds the tenaculum in the anterior lip and controls the irrigation tube; the one upon the right attends to the necessary sponging. The posterior lip is held by the weight of the tenaculum. With the knife the operator cuts through the cicatricial angle, and with scalpel and forceps denudes a corresponding surface upon each lip, in a bilateral laceration, first upon the left, then upon the right.

Fig. 179.—Edges of Laceration Turned by Tenaculum Hooked into Each Lip.

The knife is preferred to the scissors, as the denudation can be made more evenly and with less bruising of tissue. The denudation is, of course, limited to one side in a unilateral tear. A strip of undenuded mucous membrane, one centimeter wide, should be left in each lip for the future cervical canal, and the

Fig. 180.—Denudation of Lacerated Cervix.

Fig. 181.—Surfaces Denuded Ready for Union.

(Fig. 180) precaution should be exercised not to encroach upon the vaginal surface of the cervix in the removal of the tissue. In deep lacerations the circular artery may be opened in the denudation. It should be seized with pressure forceps, and the first suture should be so introduced as to control it.

Fig. 182.—Sutures Introduced.

Fig. 183.—Sutures Tied.

The sutures are placed by introducing the needle about three millimeters from the vaginal edge of the wound, bringing it out at its cervical margin, introducing it at a similar point in the other lip, and bringing it out in the vagina. Ordinarily, three sutures will be sufficient upon each side. Oc-

casionally, the laceration will be so deep that the angle suture can not be properly placed by passing the needle as we have just described. It is then preferably introduced from within outward, which can be done by carrying the ends of the suture, by means of the carrier, through first the posterior and then the anterior lip, or with two needles threaded with carriers,

Fig. 184.—Double Flap Amputation of the Cervix.—(*Auvard.*)

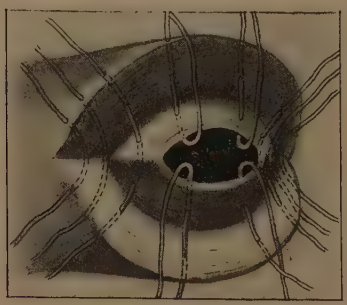


Fig. 185.—Sutures Introduced.—(*Auvard.*)

each passed from within outward, the one anterior and the other posterior. One carrier is passed through the loop of the other and drawn out. The loop thus carried through serves to carry the suture. The sutures are tied, superficial sutures are introduced, if needed, and the vagina is thoroughly irrigated. If bleeding should continue, a suture should be introduced well above the denudation to control the bleeding vessel. Avoidance of subsequent hemorrhage is particularly desirable, if a plastic operation is also to be performed upon the vaginal outlet.

Fig. 186.—Wound Closed.

268. Amputation of the cervix is to be preferred when the cervix is much elongated and hypertrophied, when the mucous membrane has become extensively hypertrophied and everted, and when cellular proliferation justifies the suspicion of incipient malignant degeneration, although when the latter condition is established complete hysterectomy would be the better course to pursue.

The amputation can be made by the double or single flap method for each lip. The instruments and preparations are similar to those given in the previous section. (Section 267.)

Double Flap Operation.—The lips of the cervix are seized and separated by double tenacula; an incision is made in each angle to the point at which it is desired to make the amputation. A wedge-shaped piece is removed from each lip, forming cervical and vaginal flaps. Two sutures are then introduced in each lip, uniting the cervical and vaginal mucous membranes. On each side a suture is passed in through the anterior vaginal and cervical flaps, out through the similar posterior flaps, and external to this such sutures as are inserted are necessary to bring in apposition the raw surfaces. The sutures are tied and superficial sutures introduced, if necessary, to nicely adjust the edges of the wound. The more accurate the adjustment, the less will be the subsequent contraction.

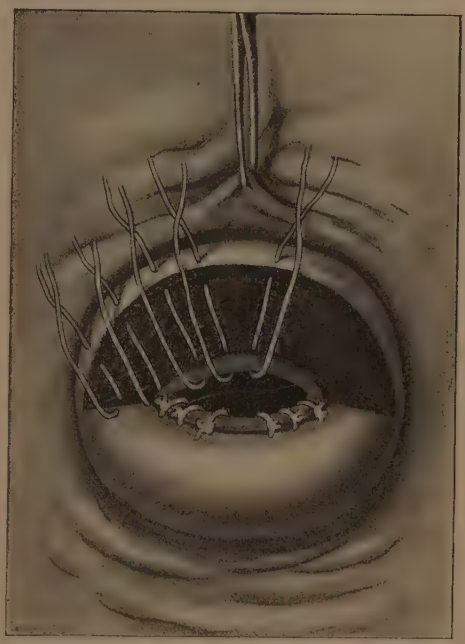


Fig. 187.—Schröder's Single Flap Operation.

Single Flap Method.—Schröder's operation consists in making the denudation at the expense of the internal or cervical portion of each lip. This operation is preferable when the cervical mucous membrane is so diseased and hypertrophied as to render its retention for the formation of a flap undesirable. In this, as in the former operation, a lateral incision is made and the lips are everted. Instead of a cervical flap a transverse incision is made into the lip from within outward, at the level of the lateral incision, cutting half through the lip; then a vertical incision to the junction of the cervical and vaginal mucous membranes. Two sutures unite the end of each flap to the corresponding cervical mucous membrane, and the remaining raw surfaces are adjusted by lateral sutures.

269. After-treatment.—The after-care does not differ in the various operations upon the cervix. In the use of the chromic catgut suture no provision is made for its removal, but it is important to preserve it from becoming infected. Unless the vaginal outlet is to be the seat of an operation, the

vagina should be loosely packed with gauze, which should be removed in two or three days. The patient is kept in bed for two weeks, and then gradually permitted to resume her ordinary duties. Any pain should be relieved by the application of an ice-bag to the abdomen. The patient should void her urine, and the catheter should be used only when it is impossible for her to empty her bladder while in the recumbent posture. Secure an evacuation of the bowels at least each alternate day. Avoid vaginal douches for the first forty-eight hours, affording the plasma opportunity to glue the apposing surfaces; then use a douche of hot sublimate solution (1 : 3000), formalin (1 : 1500), or a 1 per cent. saline solution twice daily.

Direct the patient to avoid worry or much exercise during the next menstrual period, and not to resume the sexual relation for one month.

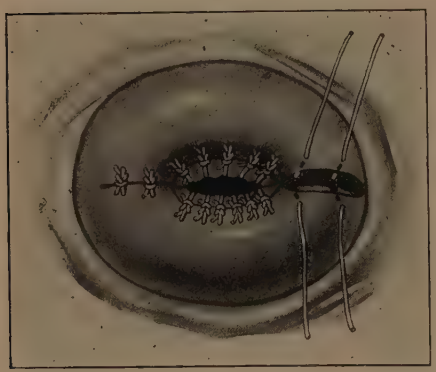


Fig. 188.—Schröder's Operation Completed.

270. Lacerations of the Vagina.—Small tears of the anterior, posterior, or lateral wall of the vagina are not infrequent, and result in cicatrices which produce more or less disturbance of the pelvic functions. Separation of the muscular wall can occur without lesion of the mucous membrane. Not infrequently the entire vagina is crowded away from its muscular attachments, so that it subsequently appears as a relaxed sac, falls into folds which drag upon the cervix, displace the uterus, or, when it is fixed, produce hypertrophic elongation of the cervix. The most frequent lesions are at the vaginal outlet, and involve that portion of the pelvic floor known as the perineum. These lesions of the vagina are so intimately associated with, and dependent upon, the condition of the perineum that their treatment will be discussed with the lesions of the latter, under the head of injuries of the pelvic floor. Lesions of the genital canal, especially of the cervix and vagina, may be induced by long-continued pressure of the head of the child during a protracted labor. The loss of tissue vitality will necessarily be dependent upon the severity and duration of the pressure.

It may involve only the superficial structures, as an erosion or superficial sloughing, when the tissues may be regenerated or, if more extensive, there results contraction and stenosis

or partial or complete obliteration of the canal, known as acquired atresia. Acquired atresia most frequently follows injuries occurring during parturition, but it can be produced by irritating injections and severe inflammations. Atresia vaginæ often occurs as a sequel of senile vaginitis. In one patient I found the entire vagina obliterated. The symptoms of such a condition are necessarily dependent upon the time of life at which it occurs. When it follows senile vaginitis, it often produces no symptoms outside those of marital inconvenience. During the menstrual life of the woman, the symptoms are similar to those of the congenital variety. The patient suffers from menstrual molimina and a pelvic tumor follows. When the vagina is the seat of atresia, the condition is easily recognized, as is the uterine accumulation, if the obliteration occurs at the external os. When the obliteration occurs at the internal os, however, and the cervix is apparently normal, the diagnosis is more difficult, and the disorder may be confounded with fibroma uteri, malignant disease, or pregnancy. The careful analysis of the patient's history, associated with the examination, should afford a reasonable suspicion as to its character.

271. Fistulæ.—Deep sloughs involving a portion of the genital tract occasionally lead to perforation of one of the adjoining viscera, and we then have a fistula. The anterior wall is the most frequently affected, and, consequently, results in a urinary fistula, which may involve urethra, bladder, or ureter, and be associated with extensive destruction of vagina and cervix. Fistulæ are divided into urinary and fecal.

The genito-urinary fistulæ are:

1. Urethrovaginal.
2. Vesicovaginal.
3. Vesico-uterine.
4. Ureterovaginal.
5. Utero-ureterine.

(Fig. 189.)

The fecal fistulæ are:

1. Anovulvar.
2. Rectovaginal.
3. Enterovaginal.

(Fig. 189.)

272. Etiology.—Fistulæ are most frequently caused by the accidents of labor. These lesions are of less frequent occurrence than formerly, the result of improved methods of delivery, by which the progress of the fetus is expedited and the maternal parts are saved from long-protracted pressure. Fistulæ are rarely the result of tearing, but generally follow a slough. Awkward use of instruments can result in perforation of the bladder or the rectum, but such lesions present a marked tendency toward spontaneous recovery.

Other causes of fistulæ are cancer involving the anterior or posterior vaginal walls, tuberculous disease, surgical operations, ulceration from the presence of a vesical calculus, and abscesses or phlegmons.

273. Symptoms.—The presence of a urinary fistula is recognized by incontinence of urine and by the appearance of urine in the vagina. A fecal fistula will permit the discharge of liquid feces and gas. A few days subsequent to her confinement the patient complains of being unable to retain her urine, or possibly it may come with a gush, following the partial or complete separation of a large slough. The parts are afterward continually bathed with urine, the skin becomes reddened and irritated, and the salts of the urine are deposited, increasing the irritation. The clothing of the patient is saturated with decomposing urine, causing a disgusting odor. Partial continence may be present when the opening is small, when it is situated high in the vagina, or when it affects but one ureter. The influence of a fecal fistula depends upon its size and situation. A small opening may permit the escape of the contents of the intestine only when they are liquid. The odor of the vaginal secretion is exceedingly offensive, so that the patient suffers an enforced retirement.

Fig. 189.—Scheme Showing Various Fistulæ.

274. Diagnosis.—Incontinence should at once awaken a suspicion of a fistula. Large fistulæ are readily recognized by vaginal palpation. Small fistulæ, associated with cicatricial contraction of the vagina, are often difficult to expose. The entire surface of the vagina should be exposed with retractors or with a Sims speculum under a good light. If the opening is small, it will be revealed by injecting the bladder or rectum with milk or other colored liquid, when the opening will be observed as the liquid escapes into the vagina.

This procedure affords a means for differential diagnosis between ureteric and enteric fistulæ. The escape of clear

urine into the vagina when the bladder is filled with a colored liquid demonstrates the ureter as the origin of the fistula. The introduction of a ureteral catheter into the sinus and of a sound into the bladder permits the recognition of the intervening septum. If the opening is small and not visible, dry the surface and apply blotting-paper while the bladder is being filled. The paper will be moistened at the site of the fistula (Pozzi). The same object can be attained by packing the vagina with sterile gauze and injecting the bladder with colored fluid. The staining of the gauze will indicate the situation of the opening. In enteric fistulæ the vagina is constantly bathed with liquid feces, and the appearance of the discharge is not affected by rectal enemata. There is an offensive vaginitis and the patient suffers from inanition. In supposed uretero-uterine fistula the position of the ureters should be examined by Sänger's method. (See Section 95.) It has been suggested that the patient urinate, then sit two hours upon a vessel, when a catheter is used; and if the quantity thus secured is equal to that in the vessel, there is a ureteric fistula. The collection has been obtained from separate kidneys.

Fig. 190.—Large Vesicovaginal Fistula with Prolapse of the Anterior Vesical Wall through the Opening.

The most ready method of recognizing the ureteric fistula is by injecting the bladder with colored fluid. The continuation of uncolored fluid in the vagina demonstrates that we are not dealing with a vesical opening.

No operation should be attempted for rectal fistula without exclusion of rectal stricture.

275. Prognosis.—The curability of a fistula depends upon its cause, situation, size, and duration. Those produced by cancer

are a part of the progress of the disease, and are incurable unless the disease can be removed. Spontaneous recovery of punctured or incised fistula is prone to occur under proper cleanliness, but an old sinus with hard, cicatricial edges requires surgical interference. An opening in the base of the bladder is more readily relieved than one in the upper part of the vagina or one in the urethra. Vesico-uterine fistulæ are particularly difficult, and the uretero-vaginal and uretero-uterine fistulæ are most trying.

Fig. 191.—Denudation of the Edges of the Fistula.

276. Treatment. — The methods of treating vaginal fistulæ as now recognized may be considered as:

1. Cauterization.
2. Denudation and suture of the edges of the fistula.
3. Flap-splitting and suture.
4. Flap-formation and sutures.

277. Cauterization is applicable only to fistulæ of small size and where but little cicatricial tissue exists. The thermocautery is the preferable means, although caustic potash, chlorid of zinc, or one of the stronger acids can be employed.

278. Preliminary treatment is important, whatever the method of operative procedure. The urine should be rendered non-irritating by the administration of benzoin salts.

℞. Ammon. benzoat., ... ʒiij
Tr. hyoscyami, ... fʒiss
Ext. buchu, ... ad fʒij. M.
Sig.—fʒj in water three or four times daily.

This prescription should be accompanied by the ingestion of large quantities of water. Hot or soothing vaginal douches should be freely employed, as a solution of sodium hyposulphite

(℥iv, aq. Oj) or weak solutions of the lead salts. If there is an incrustation of the lime salts about the orifice and over the vagina, employ a solution of dilute nitric acid (gtt. j, mucilage water f℥j). Cicatricial bands should be incised and stretched; the vaginal walls should be incised, to diminish traction upon the edges of the fistula when sutured. The cicatrization may be overcome by having the incisions heal while a Gariel pessary or a colpeurynter is worn. Bozeman employed vaginal obturators of plated copper, which, when worn, distended the vagina and gave more room for operation. The intestinal canal should be thoroughly evacuated.

Fig. 192.—Sutures Introduced.

279. Vesicovaginal Fistula.—Injuries of the vesicovaginal septum are the most frequent undoubtedly because the tissues are more likely to be compressed between the advancing head and the pubic symphysis. The operation of vivifying and suturing the edges was revived, perfected, and rendered successful by Sims. After thorough cleansing and disinfection of the vagina and the bladder, the patient is placed either in the semi-prone position, or upon her back with her limbs well flexed. The perineum is retracted and the edges of the opening are rendered tense by suitably applied double tenacula, which are held by assistants. The denudation is performed with knife or scissors, preferably the latter, as the tissues bleed less. The denudation is accomplished at the expense of the vaginal surface, exercising care to avoid injury to the vesical mucous membrane. The mucous membrane is seized with forceps at one side and the denudation is performed with the attempt to complete the circuit with the one strip. Having secured an equal denudation upon all sides, about one centi-

meter in width, the sutures are introduced. They are inserted about one centimeter apart, introducing and bringing them out about five millimeters from the edges of the denudation without permitting any suture to penetrate the vesical mucous membrane. The sutures may be introduced anteroposterior, transverse, X or Y shaped, according to the opening, that direction being chosen which will produce the least traction upon the tissues. The sutures may be silk, catgut, silkworm-gut, or silver wire, preferably the latter two. After the sutures are all in place the bladder should be irrigated in order to remove all clots, and the sutures should be tied, twisted, or secured with perforated shot, exercising care not to draw them tight enough to strangulate the inclosed tissues. After securing the sutures it is well to inject the bladder to make sure that no small opening remains. In large fistulæ care must be taken not to injure or constrict the orifice of a ureter. These canals may open upon the surface of the fistula, when the vesical surface of the ureter should be split several days before the operation and the surfaces be kept open by the frequent use of a probe.

Fig. 193.—Wound Closed.

280. Flap-splitting.—The loss of structure by denudation in large fistulæ is not infrequently a serious sacrifice of tissue, and has led to the practice of securing fresh surfaces by splitting the edges of the fistula. The vesical and vaginal surfaces are divided through the cicatrized margin to any required depth, according to the size of the fistula. When the opening is small, it can be closed by a purse-string suture. The suture of silkworm-gut or silver wire is passed through the vaginal flap within the vesicovaginal septum and brought out in the vagina directly opposite its point of entrance, reintroduced near

its exit and made to traverse the remaining side of the opening, and brought out near the original entrance. This suture, tied, turns the vaginal flap outward and the vesical inward. When the size of the opening renders it desirable to close it upon a line, the vesical flaps are closed with animal sutures, preferably of catgut. The vaginal flaps may be closed with silk or silkworm-gut.

Walcher advocates first cutting away the cicatricial tissue, then separating the vaginal and vesical surfaces. This procedure secures greater mobility of the internal flaps, which are closed with catgut by the Lauenstein stitch. The needle is introduced on the raw surface and brought out on the line of demarcation, midway between the raw surface and the vesical mucous membrane, and the reverse in the opposing vesical flap. After these sutures are tied, closing the bladder, the vaginal flaps are sutured. E. R. Corson (Savannah, Ga.) expedites the formation of the flaps and the introduction of sutures by the use of a portion of an india-rubber ball. A strong silk cord is passed through the shank of a shoe button which has been made to pierce the center of a portion of a rubber ball; this, folded, is carried by forceps through the fistulous opening. Traction upon the string draws down the opening, exposing its edges. The ease with which the vaginal and vesical portions of the septum can be separated renders flap-splitting a very ready method for closing large fistulæ. This separation can be done with impunity, because the circulation of the two surfaces is not interdependent. The incision through the vaginal portion is preferably made upon a vertical line. Beginning at one side of the fistula, one blade of a suitably curved scissors is inserted

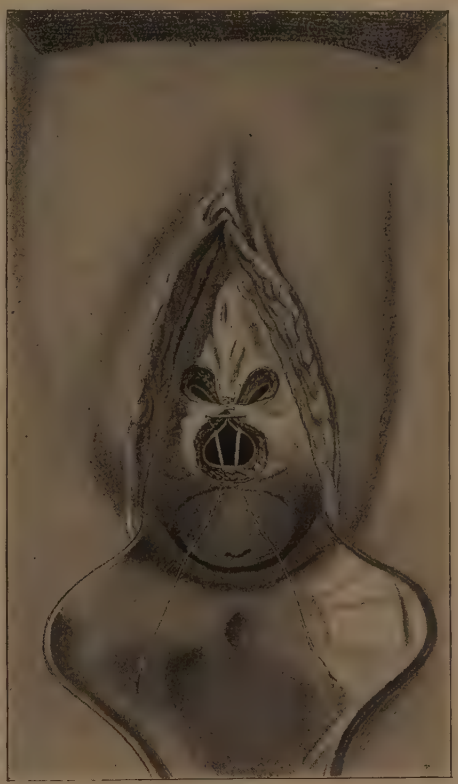


Fig. 194.—Method of Suturing to Decrease the Tension upon the Sutures.

between the two layers as exposed by the vertical incision (Fig. 198) and carried completely around the fistulous opening, and the walls are separated by blunt dissection. The separation may extend to and even through the peritoneum, where necessary, to secure additional tissue to close the opening. In closing a large fistula, the sutures in the vesical wall are preferably introduced upon a transverse line, and as they are buried, they

Fig. 195.—Showing Continuation of Suturing to Close Fistula with Incisions to Decrease Tension with Suture Introduced on Left Side to Close the Secondary Opening.

Fig. 196.—Wound Closed.

should, therefore, be of chromic catgut. The edges of the fistula should be inverted into the bladder. Each extremity should be secured by a suture, the end of which, left long and used as a tractor, permits the intervening portion to be rapidly closed with a continuous suture. These sutures should not pierce the epithelial surface of the vesical mucous membrane.

The closure of the vesical wall should be followed by distention of the bladder with a warm saline solution to make sure that it is tight. The vaginal wall should then be closed by a vertical line of suturing, which may be continuous or interrupted, as the operator prefers. In introducing these sutures the bladder surface should be included, to prevent the accumulation of serum or blood between the surfaces.

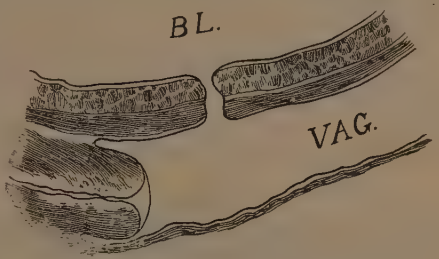


Fig. 197.—Fistula Preparatory to Splitting into Vesical and Vaginal Flaps.

The fact that the vagina has been so destroyed that it will not afford material to cover the vesical wall need not deter the operator from employing this method, as flaps can be taken from the labia or from the inner side of the thighs to complete the vaginal wall.

Fig. 198.—Demonstration of Flap-splitting.

M. C. McGannon, of Nashville, very ingeniously closed a fistula in a woman who had a laceration of the rectovaginal septum half-way to the cervix, and the anterior vaginal wall and base of the bladder were gone. He dissected the bladder away from the uterus and pushed the peritoneum off until he could bring the flap down to the lower segment, and closed it with fine catgut. After closing the bladder, the surface was covered as much as was possible with the remaining portion of the vagina. A large surface was left uncovered for cicatrization. The left ureter had been included in the bladder, but the orifice of the right was situated so high

in the vagina that it was inaccessible, but was subsequently conducted to the bladder by an artificially constructed conduit. A year later her condition was good, with perfect control of the urine.

In extensive fistulæ Trendelenburg advocates making a transverse incision ten centimeters long through the abdominal

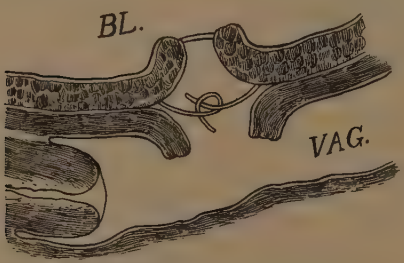


Fig. 199.—Suture Introduced into Vesical Flap.

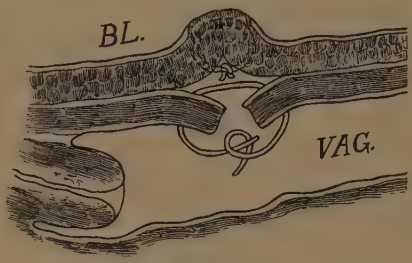


Fig. 200.—Suture Tied in Vesical Flap Introduced in Vagina.

walls, and a transverse incision through the bladder, just below the peritoneal junction. The upper edge of the vesical wound is temporarily stitched to the corresponding abdominal, and the lower edges of the bladder are held open with sutures. The edges of the fistula are trimmed and the sutures so introduced that their ends can be brought out and tied from the vagina. The anterior vesical wound is closed around a drainage-tube, gauze is placed in the prevesical space, and both are brought through an opening in the abdominal wound, the remaining portion of which is closed with sutures.

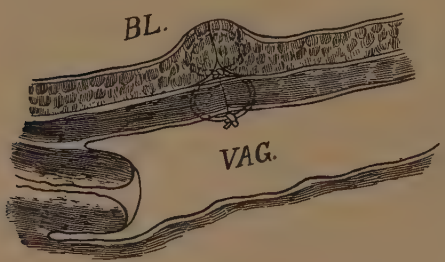


Fig. 201.—Wound Closed.

Bardenheuer formed a flap by transplantation. He performed suprapubic cystotomy, and through the abdominal wound dissected the bladder away from the peritoneum as low as the fistula, separated the adhesions and cicatricial tissue, denuded the edges of the fistula and sutured them from the vagina, while the edges of the fistula were pressed together by the finger passed into the bladder through the suprapubic wound. The abdominal wound is plugged with gauze and left open. By utilizing a vesical flap, the operation can be performed through the vagina, as described above.

281. Flap formation is a procedure practised by Ferguson, of Chicago. Ferguson, and E. Stanmore Bishop, of Manchester, England, made an incision with a scalpel through the vaginal mucous membrane three to six millimeters from the margin of the fistula (Fig. 203). This incision completely encircled the opening and extended to, but without injuring, the vesical wall. The wound was kept free from blood by a stream of sterilized water. This procedure formed a circumferential flap,

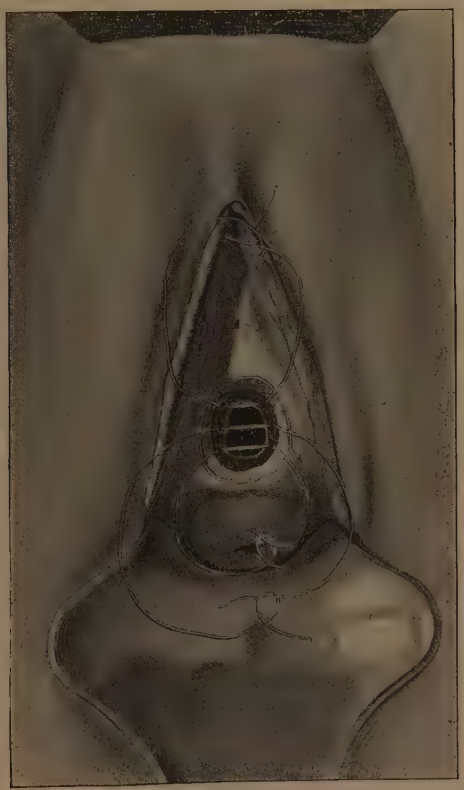


Fig. 202.—Sutures Introduced to Close Vesical Surface, as Suggested by Walcher.

hinged by the vesical mucous membrane, which, turned into the bladder, formed a roof for the raw surface and was held in that position by a continuous fine chromic catgut suture so inserted that it did not pierce the mucous wall of the organ (Fig. 204). The narrow strip of vaginal tissue, which from its density retained the stitches well, became a part of the bladder-wall. The fistulous opening was thus closed and made

water-tight. The operation was completed by suturing the vaginal walls with silkworm-gut or silver wire. (Fig. 182.) Bishop ingeniously inserts four sutures into the edges of the flap as constructed by Ferguson, and with a pair of forceps passed through the urethra drags these sutures, previously knotted, out through that canal. The funnel thus formed is closed with a suture from the vagina and the vaginal walls are sutured over it. The advantages justly claimed for this plan

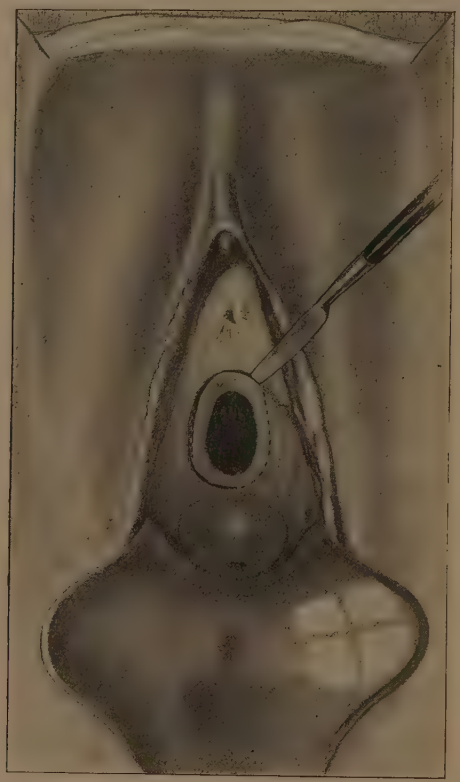


Fig. 203.—Flap-formation as Suggested by Ferguson.

are: first, there is no loss of tissue; second, a broad surface is secured for apposition; third, there is a projection into the bladder at the site of the opening which decreases the danger of leakage and infection; fourth, in case the ureter opens into the fistula, it affords an opportunity to turn it into the bladder; fifth, it decreases the danger of primary and secondary hemorrhages; sixth, in large openings it affords the best opportunity

to secure relaxation by incision or sliding flaps; seventh, it is applicable to fistulæ of the bladder, urethra, or rectum.

282. After-treatment.—The vagina, thoroughly cleansed, should be lightly packed with iodoform gauze, which should remain for two or three days. Continuous drainage should be secured by the introduction of a self-retaining catheter into the bladder. This should be removed daily, for the purpose of cleansing. At the end of eight days it should be removed

Fig. 204.—Flap Turned in and Vesical Opening Closed.

permanently; but the patient should be catheterized four times daily for the next week. The vagina should be irrigated with an antiseptic solution twice daily after the third day, and this should be continued for the greater part of three weeks. The sutures should be removed on the fifteenth day.

283. Closure of the Vagina.—Colpocleisis.—Episiostenosis.—Large fistulæ in which the base of the bladder is destroyed

may be indirectly obliterated by closure of the vaginal orifice, thus making the vagina a part of the urinary reservoir. A ring of tissue two centimeters broad is removed from the vaginal orifice. In the dissection the parts should be kept on the stretch and the tissue should be dissected from above downward. A sound in the urethra and a finger of an assistant in the rectum will greatly facilitate the denudation of the anterior and posterior walls of the vagina. The sutures should be passed

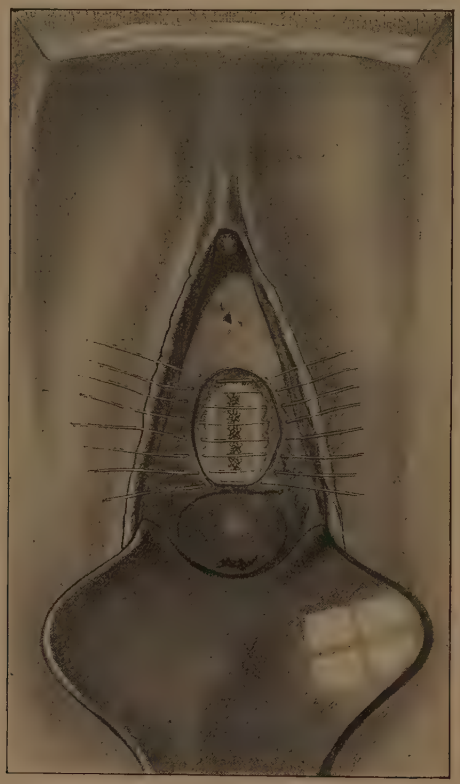


Fig. 205.—Introduction of Vaginal Sutures.

from below upward and from above downward, exercising the greatest care that neither rectum, bladder, nor peritoneum shall be perforated by the sutures. The denuded surfaces should be brought in accurate apposition and the overlapping of freshened surface with mucous membrane or skin should be strictly avoided. This procedure, while it affords a means of relieving incontinence of urine in otherwise desperate cases,

has many disadvantages. Impregnation is no longer possible; coition can be practised only when obliteration has occurred

Fig. 206.—Section Showing Projection upon Vesical Surface.

Fig. 207.—Self-retaining Catheter.

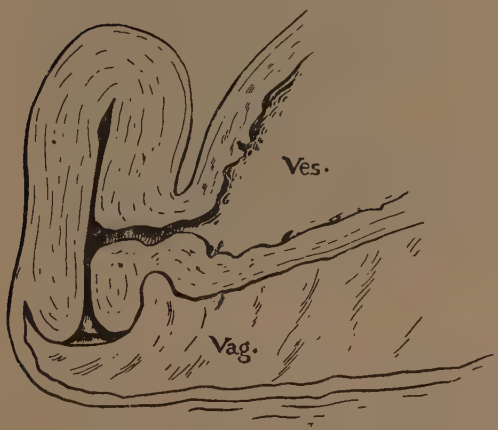


Fig. 208.—Vesico-uterine Fistula.

high in the vagina. The menstrual blood not infrequently excites violent cystitis, resulting in pyelonephrosis and the

formation of vesical calculi. The urine may cause metritis or tubal, ovarian, and even peritoneal inflammation. Recto-vaginal fistula has been made to supplement this operation when the neck of the bladder has undergone such injury as to render the patient unable to retain the urine. The majority of such cases have been unsuccessful, owing to the irritation of gas and feces and the inclination of the fistula to close.

284. Urethrovaginal fistula is very infrequent. It is char-

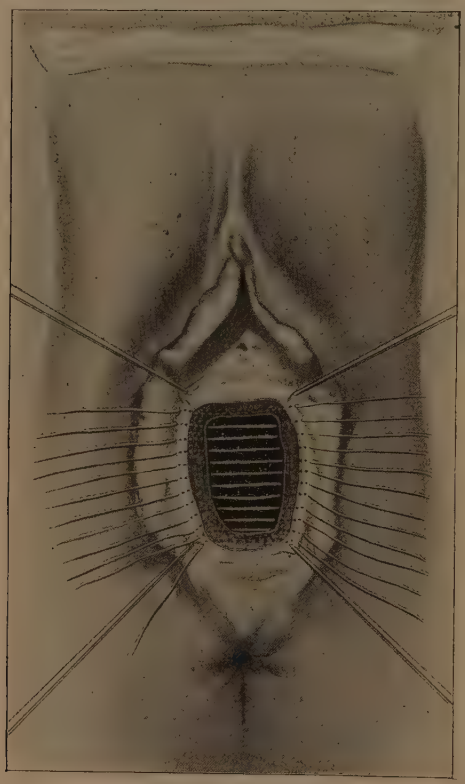


Fig. 209.—Colpocleisis.

acterized by the discharge of urine into the vagina during micturition. The flap-splitting operation affords the most satisfactory method of closing it.

285. Vesico-uterine fistula permits the escape of urine through the external os. It may result from a slough following a tedious labor, and from lacerations of the cervix when the tear has extended through the anterior lip. The tear may

have been incomplete, not extending through the os, or the fissure may have healed with the exception of the communication between the bladder and cervix. The only condition with which such a fistula can be confused is the uretero-uterine. The latter fistula is rare. Upon injecting the bladder with a colored fluid (a solution of pyoktanin) its emergence from the os demonstrates the presence of a vesical fistula; the continuance of clear fluid, a ureteral. In an opening of consider-

Fig. 210.—Closure of Fistula after Its Exposure by Incision through Anterior Vaginal Fornix.

able size the sound will pass directly into the bladder, where it can be recognized by another inserted through the urethra.

Treatment.—The fistula may be exposed by dilating the cervix with a laminaria tent. In a uretero-uterine fistula this procedure would be accompanied with renal pain, nausea, and vomiting, due to the obstruction of urine from the kidney

corresponding to the affected ureter. The fistula may be denuded and closed from the cervical canal, but the operation is attended with difficulty. The preferable procedure is to cut through the anterior fornix of the vagina and dissect the bladder from the cervix, when the opening can be exposed and sutured; the vaginal wound is subsequently closed with silk or catgut. It is desirable that the peritoneum should not be opened, though its incision, with proper precautions, does not materially affect the result. When the bladder-wall is thin, Herr advises cutting through the cervix and reinforcing the bladder-wall with cervical tissue. Sänger split the cervix of a patient in whom the sinus opened laterally, sutured the

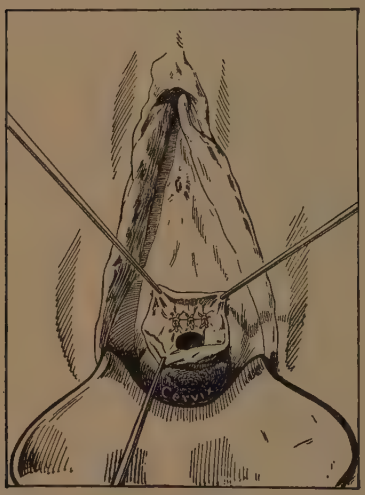


Fig. 211.—Fistula Closed into Vagina. Uterine Opening Remains, Which Will Close of Itself.

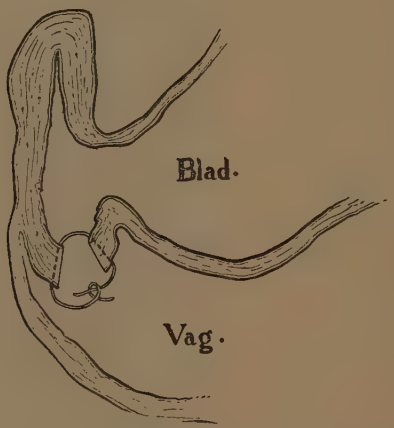


Fig. 212.—Section Showing Suture for Hysterocleisis.

side on which the fistula occurred, as in an Emmet operation, and then sutured the other side.

286. Hysterostenosis or hysterocleisis (Fig. 214), the denudation and suturing of the cervix, is possible, but the menstrual flow may produce serious cystitis, and contraction of the fistula may result in severe pain and distress during menstruation.

287. Vesico-uterovaginal (Cervical) Fistula.—A portion of the cervix, with a considerable portion of the vaginal septum, may be destroyed, and the remaining walls may be so thin as to render its closure difficult or dangerous, owing to proximity of the peritoneum. In such cases the anterior lip of the cervix

(Fig. 215) may be denuded and turned into the bladder, using it as a plug to fill up the opening.

When the fistula has developed at the expense of the anterior cervical lip to such an extent that it will not afford sufficient structure to close the opening, the posterior lip may be freshened and utilized (Fig. 216). This procedure necessarily produces disturbance because of the continuance of menstruation. A

Fig. 213.—Closure of Fistula within Cervical Canal after Splitting Cervix.

preferable method is to separate the vesical wall from the cervix and secure sliding flaps, which can be closed as in figure 217.

288. Ureterovaginal-ureterocervical Fistulæ.—Lesions of the ureter are less frequent than the other forms of fistulæ. Participation of the ureter in the vesicovaginal opening is much more frequent. Ureterovaginal fistulæ are more frequently the result of injuries sustained during the performance of hysterectomy. The *diagnosis* has been considered. (See Section

274). The cervical fistula is very rare. The thickened ureter can generally be traced to the cervix by the finger in the vagina.

Treatment.—Relief from the discomfort produced by these fistulæ may be accomplished by resort to one of several methods, viz.:

1. Anastomosis through the vagina.
2. Anastomosis through the abdomen.

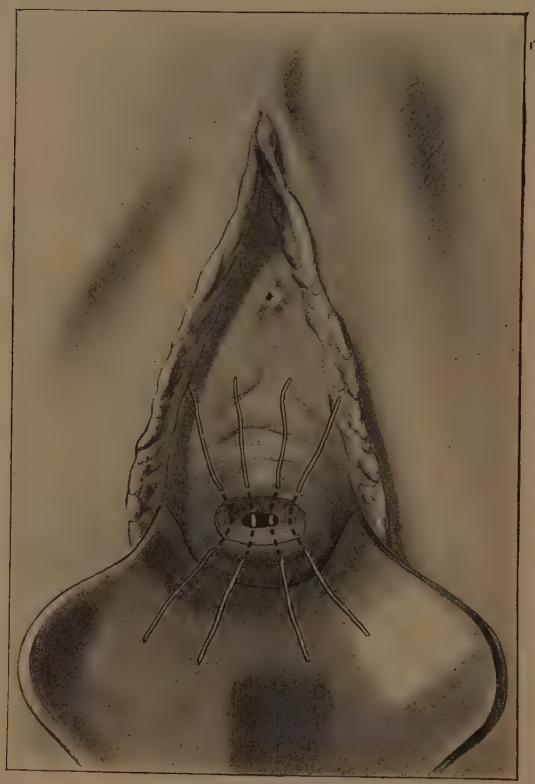


Fig. 214.—Hysterocleisis.

3. Ligation of the ureter.
4. Introduction of the ureter into the rectum or colon.
5. Nephrectomy.

Anastomosis through the vagina is accomplished by first establishing an artificial vesicovaginal fistula alongside the ureter. This opening, and the ureter opened for the distance of nearly two centimeters of its intraparietal border, are prevented from closing by the subsequent daily use of the sound. After permanent cicatrization has taken place, the vesicovaginal fistula,

which now includes the ureteral, is closed by denudation and suturing the new surfaces (Simon). The vesicovaginal fistula may be formed by an oval incision. A small elastic catheter can be passed into the bladder, through the urethra, from it through the fistula into the vagina and then into the orifice of the ureter. With the patient in the genupectoral position the vaginal mucous membrane is denuded around the fistula. To close the opening, the sutures are placed parallel to the catheter, which is left in place for several days (Landau); or a buttonhole incision may be made, removing two centimeters of the vesical mucous membrane in the direction of the ureter, the vesical and vaginal mucous membranes are sutured to prevent closure, and a catheter is introduced into the bladder through the urethra and into the orifice of the ureter through the vesical fistula. An

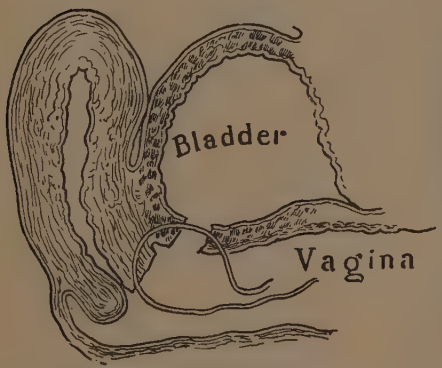


Fig. 215.—Anterior Lip of Cervix Utilized to Close the Fistula.

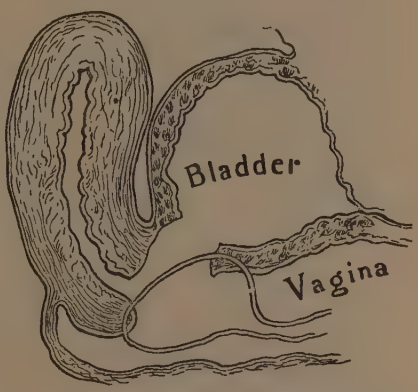


Fig. 216.—Vesico-uterovaginal Fistula in which the Posterior Lip of the Uterus is Utilized to Close the Opening.

annular denudation is made about the fistula, leaving immediately about it a zone of mucous membrane three millimeters in diameter. After suturing, the fistula with intact mucous membrane is turned into the bladder, where it forms a gutter-like depression, into which the ureter opens (Schede). X. O. Werder, in a case of double ureterovaginal fistula following hysterectomy, made a transverse incision through the anterior vaginal wall into the bladder. The vaginovesical edges of the upper portion were sutured together, while the inferior border was united to the posterior vaginal wall, making a diverticulum to the bladder which controlled leakage.

All these methods employ the formation of an artificial vesicovaginal fistula, which must ultimately contract. As the

ureter is a distinct canal, capable of being dissected out of its bed, there seems no reason why it should not be loosened from cicatricial adhesions, drawn down, and introduced through an opening in the vesicovaginal septum. This procedure is applicable to either vaginal or cervical fistulæ of this canal. In order to prevent compression of the ureter a portion of the bladder-wall should be excised. The ureter is introduced into the bladder, the wound is carefully closed with sutures introduced to fix the wall of the ureter and thus insure its retention. Care should be exercised that the ureter is not compressed, nor much, if any, of its surface left uncovered in the vagina. In ureterocervical fistulæ the cervix should be split until the orifice of the ureter is exposed, when that structure can be drawn down and union accomplished in the manner just described. Obliteration of the vaginal orifice has been done after the establishment of a vesicovaginal fistula, but such a course is both unnecessary and undesirable.

Fig. 217.—Vesical Wall Loosened and Sutured. Vaginal Wall Sutured in Opposite Direction.

Anastomosis through the abdomen may be preferable in a narrowed cicatricial vagina, or when the lower extremity has undergone inflammatory changes or is so embedded in exudation that it can not be readily brought down. Through the ordinary incision for abdominal section the intestines are drawn aside, exposing the line of the ureter. In ureterovaginal fistula its situation can the more readily be recognized by the introduction of a catheter prior to the abdominal incision. The peritoneum is opened, the ureter is raised, its proximal portion is tied and dropped back, and the central end is introduced through an incision into the bladder and secured by sutures, as in the vaginal method. The anastomosis with the bladder should be on the

corresponding side of the pelvis, and with as little tension upon the canal as possible. Should the ureter be so short as to cause tension in reaching the bladder, the latter should be drawn up and anchored by a few stitches to the side of the pelvis, so that no traction shall be made upon the ureter. If the ureter it too short to permit of its introduction into the bladder, and the condition of the patient is unfavorable for a complicated operation, the ureter may be tied with a double ligature and dropped back. The urine accumulates in the pelvis of the kidney until the pressure equals that of the blood, when secretion ceases. The ureter may also be introduced into the rectum or colon. The ureter should pass through the bowel obliquely. However, this procedure is very likely to be followed by serious conditions in both the urinary tract and the intestine. In the former, infection and suppuration of the pelvis of the kidney are prone to follow. The presence of urine frequently causes irritation and inflammation (colitis or proctitis) of the intestine.

Nephrectomy is advisable when the long duration of the fistula has resulted in extension of infection to the pelvis of the kidney, and careful examination has disclosed that the other kidney is capable of carrying on the work of both organs.

Fig. 218—Operation for Ureterovaginal Fistula.

289. Accidents of the Operation and Results.—*Primary hemorrhage* of a serious character may result from an unusually large uterine artery, from vascular walls, or from injury of the vesical mucous membrane. Either compression or suture is the best means for its control, but its occurrence imperils the result of the operation.

Secondary hemorrhage may take place between the third and fifth days, and should be controlled by the tampon. It may occur into the bladder, and may be discovered only after that organ is filled with clot. It gives rise to violent tenesmus, and its decomposition will be extremely prejudicial to the success of the operation. When it can not be removed by irrigation, inject

a solution of pepsin or enzymol. If this procedure fails to afford relief, the urethra should be dilated and the clot broken up and removed with a blunt curet. If hemorrhage continues,

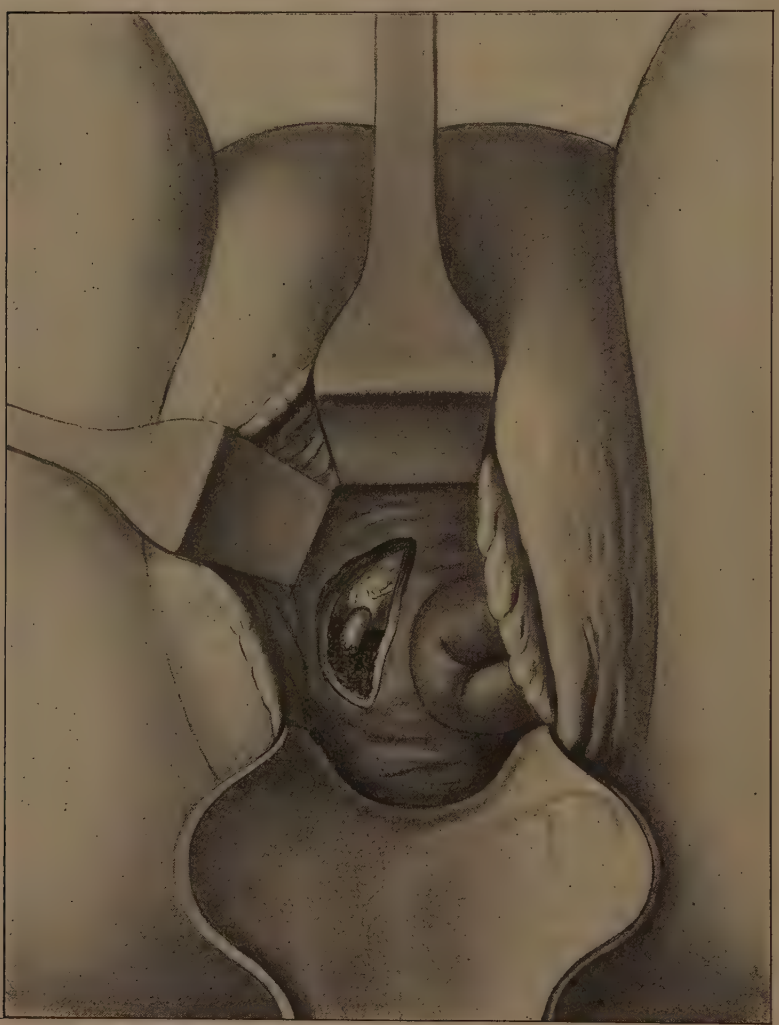


Fig. 219.—Vaginal Implantation of the Ureter into the Bladder.

it will be necessary to remove the sutures and search for the bleeding vessel.

Inclusion of a ureter will cause nausea, vomiting, lumbar pains, and fever. The suspected suture should be immediately removed.

Peritonitis can result from injury during the denudation or suturing, or from infection, when proper precautions have not been observed, or when there is coexisting pyelitis or cystitis.

Calculi and calcareous concretions have formed upon silver wire, silk, or even catgut sutures.

The results of the operation are generally most satisfactory. Death is of very infrequent occurrence.

290. Rectovaginal Fistula.—The methods of treatment suggested (Section 276) are equally applicable to the fecal fistulæ.

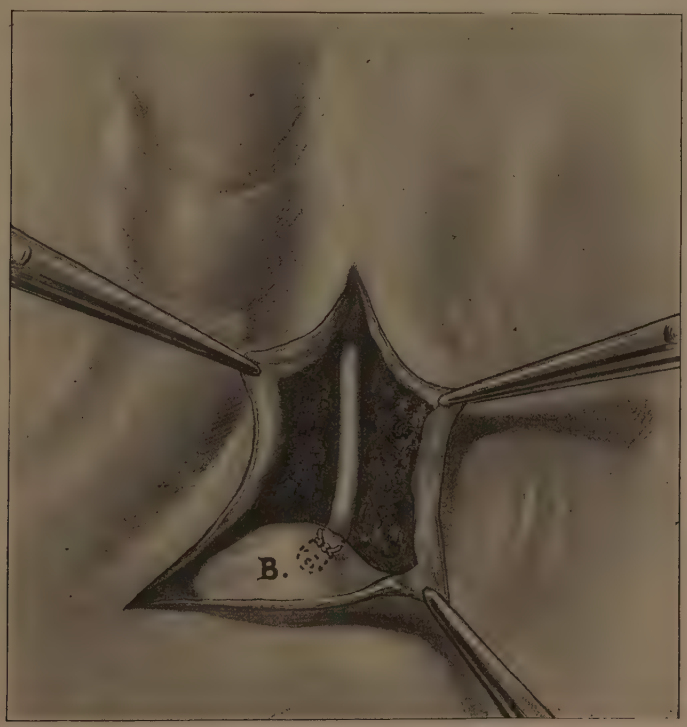


Fig. 220.—Abdominal Transplantation of Ureter for Ureterovaginal Fistula.

The last two methods, flap-splitting and flap-formation, are probably effective and most generally applicable in the great majority.

In a small fistula a curvilinear or triangular trap-door may be raised, including the fistulous orifice; the opening in the rectal wall is closed by very fine (eye) silk, which has been previously sterilized, or by chromicized catgut; one or several Lauenstein sutures may be used, being careful not to enter the

rectum. The vaginal flap is then secured with silkworm-gut sutures. In large fistulæ a sagittal incision with lateral flaps is most satisfactory. The sutures are introduced as previously described. Flap-formation is very serviceable in closing rectal fistulæ of considerable size; flap-transplantation is rarely successful.

291. An anovulvar fistula can be closed from the vagina or

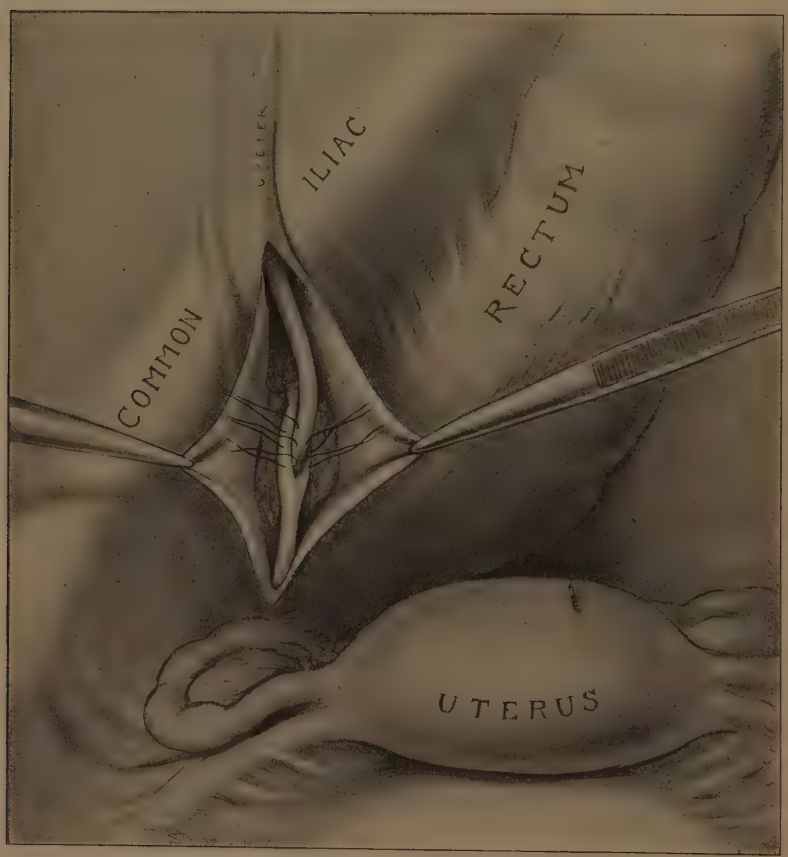


Fig. 221.—Ureteral Anastomosis.

perineum. Such a fistula is incised through its track, cureted, and the entire sinus closed by sutures. It is generally better to extend the incision to, but not through, the sphincter, and to close the rectal or anal surface with sutures from the perineal side, when failure to unite will not endanger the future value of the sphincter and will enable the operator to secure union

by granulation through gauze packing. Small fistulæ near the vulvar outlet can be closed as a part of the operation of perineorrhaphy.

292. Preliminary and After-treatment.—The bowels should be thoroughly evacuated by repeated purging for two or three days. During the same period vaginal douches should be given, and a thorough scrubbing of the vagina with a solution of creolin and soap should immediately precede the operation. However, no operative procedure for closing a fistula should be entered upon until careful rectal examination has demonstrated the absence of a possible rectal stricture as its cause. For several days prior to the operation, and for at least a week

Fig. 222.—Sagittal Incision for Rectovaginal Fistula.

Fig. 223.—Lauenstein Suture in Rectovaginal Fistula through Rectal Wall.

subsequently, the patient should be kept upon an animal broth diet, and the use of milk should be prohibited. The operation should be preceded a few hours by thorough irrigation of the rectum, and continuous irrigation should be practised during it. After the third day the bowels should be moved each alternate day. The sutures of silk should be removed upon the eighth day; silkworm-gut or silver wire may be permitted to remain for fifteen days. The patient should be confined to bed the greater part of three weeks, and the bowels should not be permitted to become constipated for a month.

293. Enterovaginal fistulæ have been cured by cauterization or by denudation and suture from the vagina, but closing

the fistulous intestine through the open abdomen is preferable, when the vaginal opening will need no further consideration.

294. Lacerations of the pelvic floor are a frequent lesion of parturition, and can occur from within outward through the vagina and vaginal portion of the perineum, leaving its integumental covering intact. The injury is a separation or tearing-off of the muscular fibers from the sides of the vagina. Generally, the tear takes place through the integument of the perineum, sometimes it may extend through the entire structure, the sphincter, and up the rectovaginal septum. Not

Fig. 224.—Rectal Wall Closed by Transverse Line of Sutures; Vaginal by Vertical Line of Sutures.

infrequently it will be found that the injury has been quite as deep, but on one side of the rectum and anus, and leaves both intact. Less frequently it will thus extend on both sides of the anus.

Naturally, the influence upon the subsequent appearance and function of the parts must vary with the extent and direction of the laceration. A slight laceration, which involves only the anterior portion of the perineum, may heal without producing much, if any, deformity. A deeper laceration, by the action of the transversus perinei muscles, permits the vaginal

orifice to stand open, and presents a triangular appearance. The failure of the bulbocavernosi muscles longer to antagonize the coccygeus permits the anus to be drawn back.

Laceration through the sphincter necessarily causes loss of control of the bowel-contents. (Fig. 226.)

The deep laceration to one side of the anus leaves the levator ani unantagonized, and the parts are drawn to the opposite side; when the tear extends upon both sides, the anus is depressed

Fig. 225.—Rectovaginal Fistula Closed in Operation of Perineorrhaphy.

and drawn backward. The vulva stands open, and we can look into the vagina from three to five centimeters.

295. Causes.—Injuries of the pelvic floor may arise, first, from conditions inherent in the mother; second, in the child; and third, in the course and management of the labor. Of the first class may be (*a*) too great or too slight an inclination of the pelvis, which renders the mechanism of the fetal head imperfect; (*b*) a small vulvar orifice with rigid muscles, or a

large amount of fat in the perineum; (*c*) high or anterior situation of the vulva, making a long perineum, over which the child's head must be extended.

Second, laceration may result from excessive size of the fetal head and shoulders or from relative disproportion to the size of the mother.

Third, laceration may result from (*a*) either too rapid or too tedious labor; (*b*) vertex presentations when rotation occurs

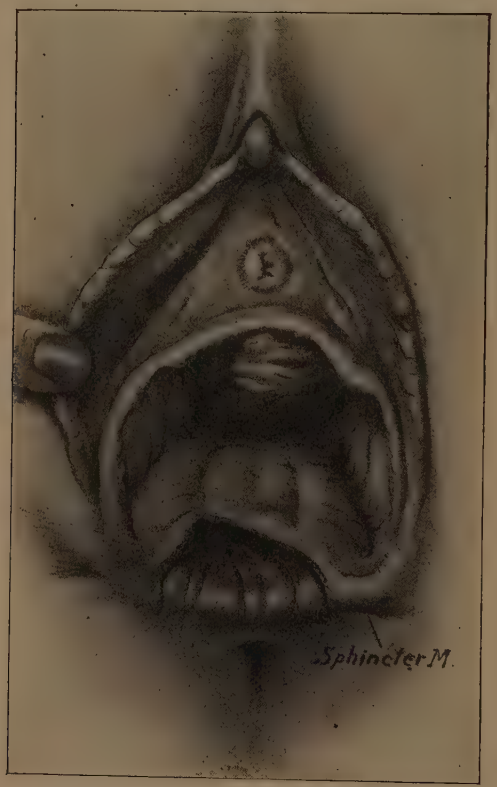


Fig. 226.—Rupture of Perineum into Rectovaginal Septum.

into the hollow of the sacrum and an occipitoposterior position presents a longer diameter of the head at the outlet; (*c*) face presentations, in which the longest diameter of the fetal head presents; (*d*) either incomplete or excessive flexion; (*e*) faulty manual or instrumental interference.

296. Degree or Extent.—Lacerations of the pelvic floor may be incomplete or complete, and are generally divided

into four degrees: First, a tear through the fourchet and to a slight extent in the perineum; second, to the sphincter. These form the incomplete lacerations, while the complete are: third, the tear extending through the sphincter; and, fourth, up the rectovaginal septum. A rare form of laceration is the central rupture, in which the fetus passes through the perineum without tearing either the sphincter or the vulva.

297. The results of the injury are necessarily dependent

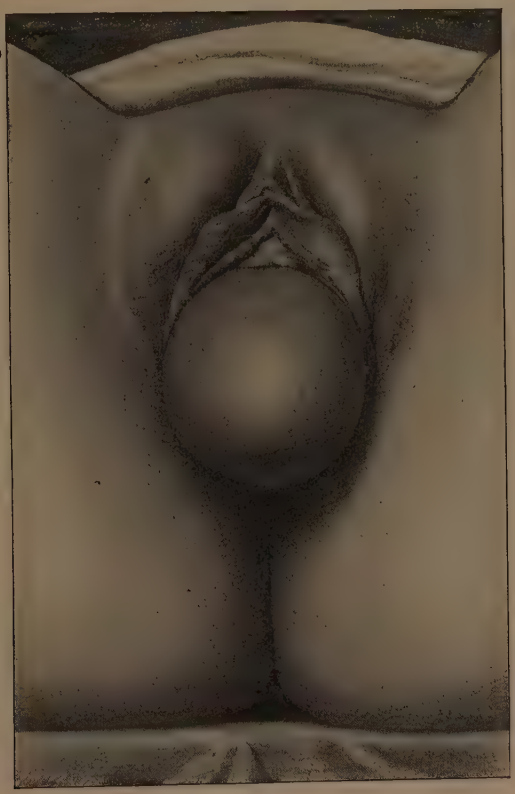


Fig. 227.—Cystocele.

upon its extent. The immediate effects are induced by the action of the injured or antagonistic muscles. The cicatricial tissue produces certain reflex nervous phenomena, which, however, are insignificant compared to the mental influence exerted by fecal incontinence. The laceration causes defective involution of the vagina and uterus, the defect in the muscular junction of the pelvic floor weakens the action, and consequent

resistance of the pelvic diaphragm. The constantly varying pressure of the bladder and rectum, the increased abdominal pressure consequent upon straining at stool, and the abnormally heavy uterus lead gradually to displacement downward of that organ, or, if it is fixed by the condition of its pelvic attachments, to extrusion of the anterior and posterior walls of the vagina, and their consequent weight will produce hypertrophic elongation of the cervix. Thus we have cystocele (prolapse of the

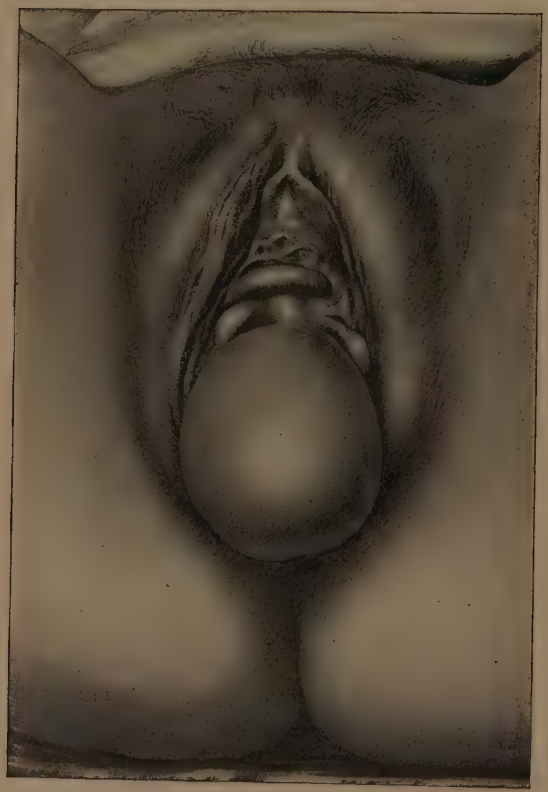


Fig. 228.—Rectocele.

anterior vaginal wall, and with it the bladder), rectocele (prolapsed posterior wall), partial or complete prolapse of the vagina, with elongation of the cervix, or procidentia, consequent upon the increased weight of subinvoluted organs and the diminished support resultant from the lesion under discussion.

298. Treatment.—The proper course of procedure is to so repair the injury as to restore as nearly as possible the normal

condition of the pelvic floor. In slight lacerations restoration will be secured by keeping the patient quiet and the parts clean. The operative treatment may be primary, intermediate, or secondary.

299. By primary operation is understood the immediate repair of the laceration, or at least within twelve hours. The tear presents a large, raw surface, and is frequently found with ragged, irregular edges. The vagina may have been torn and the soft parts pushed off until the perineum has split either through the sphincter or to one or both sides of the anus. The method of repair will depend upon the nature and extent of the lesion. The necessary instruments will be found in an ordinary pocket case—scissors, dissecting forceps, a needle-holder, and long and short curved needles. The suture material may be silkworm-gut, catgut, silk, or silver wire. The patient should be placed upon her back across the bed, or upon a table, while an assistant holds each leg, flexed upon the abdomen. As the parts are, benumbed by the stretching to which they have been subjected,

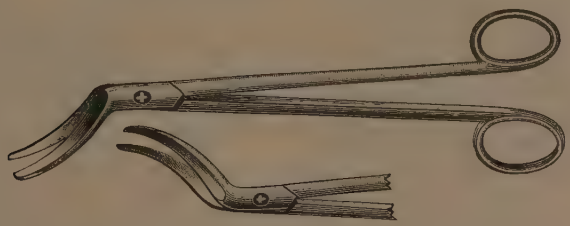


Fig. 229.—Right and Left Curved Scissors.

an anesthetic may be omitted; but if the patient is very nervous, one should be employed. A rubber pad or a piece of mackintosh should be placed beneath the patient to prevent soiling of the bed and to direct the current of irrigating fluid into a receptacle upon the floor. Compress the uterus and cleanse it and the vagina of clots; cleanse the external surface with a disinfectant fluid, after having trimmed the vulvar hair in order to keep it from embarrassing the procedure. Place a pad of gauze or absorbent cotton beneath the cervix to keep the vagina free from blood. Trim smooth the ragged edges of the tear and proceed to suture. Fine chromicized catgut is preferable, because it will not have to be removed, and it produces less annoyance during the care of the patient than does either silkworm-gut or silver wire. In slight lacerations and vaginal tears the use of the continuous suture is satisfactory. In extensive laceration interrupted sutures offer advantages. Precautions should be exercised to leave no dead spaces in which blood may accumulate,

become infected, and produce sepsis. In a double tear which extends upon both sides of the rectum the needle should be entered from above, brought out in the sulcus, reentered, and carried upward through the vaginal mucous membrane, so that each suture lifts up the tissue. Care should be exercised to restore the position of the levator ani muscles by bringing their torn ends back in position. So far as possible the sutures should be brought out in the vagina, as they thus produce less pain.

Fig. 230.—Incomplete Rupture of the Perineum.

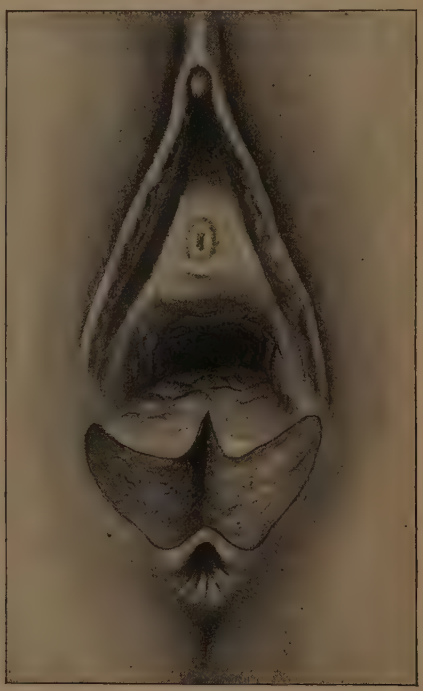


Fig. 231.—Simon-Hegar Method of Denudation.

The necessary perineal suturing may be with continuous suture, inclosing but little of the skin.

In laceration of the sphincter make sure that the ends of the divided muscle are secured and coapted by the suture. When the tear has extended into the rectovaginal septum, the sutures may be brought out and tied in the rectum, or, what is probably preferable, the Lauenstein suture may be employed, with buried catgut.

300. The advantages of the primary procedure are: first, if the operation is successful, the patient is spared the necessity of

a subsequent operation; second, with proper precautions she is much less likely to suffer from infection, and convalescence is expedited; third, the sequelæ of unrepaired injuries are avoided.

301. Contraindications.—The primary operation is contraindicated when the patient has been exposed to a prolonged labor and the tissues have undergone extensive fraying or bruising through prolonged manual or instrumental interference. It is also contraindicated when there is reason to believe that the wound has been exposed to some virulent infection. Even in such cases, when the laceration extends through the sphincter,

Fig. 232.—Sutures Introduced to Close the Wound.

the anus and rectal wall should be sutured, in order to afford security to the contents of the bowel.

302. The intermediate operation is performed any time from twelve hours to a week following the labor. The delay may be occasioned by want of proper material at hand, or it may be due to the condition of the patient, who is suffering from such profound shock that it will seem unwise to resort to any immediate procedure. With the delay, the surface becomes covered with plasma, and, later, granulations form, the surface is irritated

by the lochia, and, unless strict antisepsis has been practised, it becomes an excellent culture field. Prepared as in the primary procedure (Section 299), the vagina is cleaned, gauze is applied to restrain the uterine discharge, the wounded surface is scraped with a curet or knife, the edges are trimmed, and the parts are sutured. The results are not usually very satisfactory.

303. Secondary Operation.—This operation is preferably not performed for at least two months subsequent to delivery, in

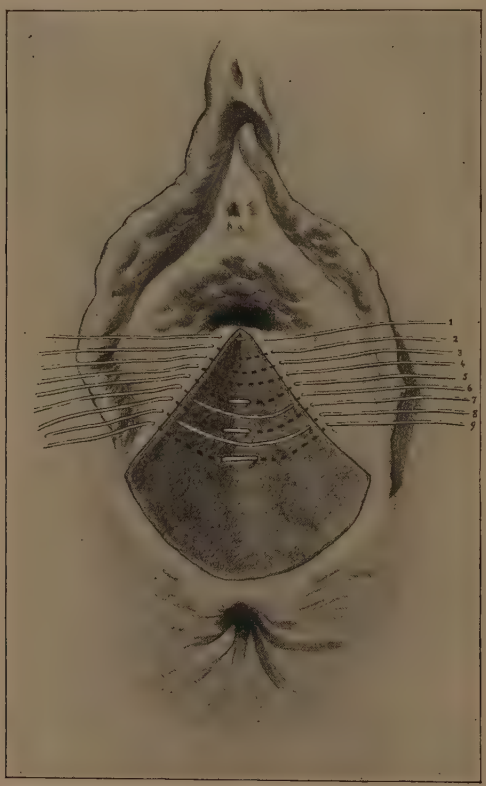


Fig. 233.—Garrigues' Modification of the Hegar Operation.

order to permit involution and cicatrization to become accomplished. In preparation, particularly when the tear is complete, the bowels must be thoroughly evacuated. Castor oil, a saline, or compound licorice powder should be given several days or a week before the operation and repeated at intervals of from twenty-four to forty-eight hours, in order to insure thorough evacuation of all hard scybalous masses. The diet should con-

sist largely of animal broth, while milk should be absolutely excluded. The evening and morning before the operation the lower bowel should be cleansed with large enemas. The last enema should be given at least three hours before the time fixed for the operation. Patients should be prepared (Section 119), and the following instruments sterilized: a scalpel; right and left curved scissors, as well as scissors curved on the flat; three double tenacula; eight pressure forceps; one long, rat-toothed dissecting forceps; a needle-holder; and two long and two short

Fig. 234.—Upper Part of Wound Closed; Last Sutures Introduced.

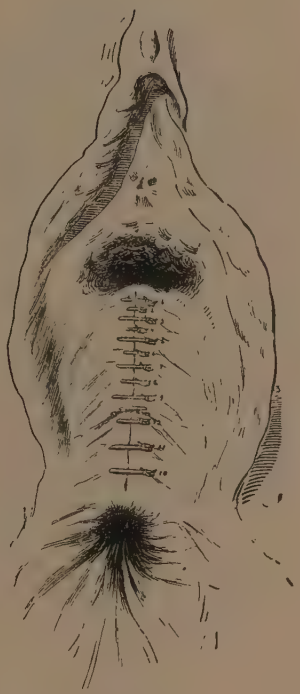


Fig. 235.—Wound Completely Closed.

curved needles, all threaded with carriers. The suture material may be silk, silkworm-gut, catgut, or silver wire. In extensive laceration the silkworm-gut is preferable, for the reasons, first, that it, being more pliable, causes less pain during convalescence than wire, and, second, it is much less likely to become infected than either silk or catgut.

Incomplete laceration (Fig. 230) may be repaired by a simple denudation of the torn surfaces (Fig. 231). As cicatrization has

resulted in contraction, it is necessary to extend the denudation of the vagina above the scar tissue. The further backward the rent extends, the higher into the vagina the denudation must be carried. The line of denudation extends posteriorly from the junction of the mucous membrane and skin at the top of the old posterior commissure across in front of the anus to a corresponding point upon the opposite side, while an angle extends up the vagina above the tear. The completed denudation

Fig. 236.—Lauenstein Suture.

Fig. 237.—Rectum and Vagina Closed with Lauenstein Suture.

presents a resemblance to the body and wings of the butterfly, and is designated the Simon-Hegar denudation. (Fig. 232.)

The sutures are introduced about three millimeters from the margin of the wound, buried beneath the denuded surface, and brought out at a corresponding point upon the opposite surface. The sutures in the vaginal angle are first secured, and then the perineal (Fig. 232). The sutures when tied produce less discomfort than if secured by compressing perforated shot upon their

ends. The quill or bar suture was formerly much favored. It consisted of a quill placed in the loop of a double suture upon one side, the ends being tied over a second quill upon the opposite side, or the ends of a suture were passed through openings

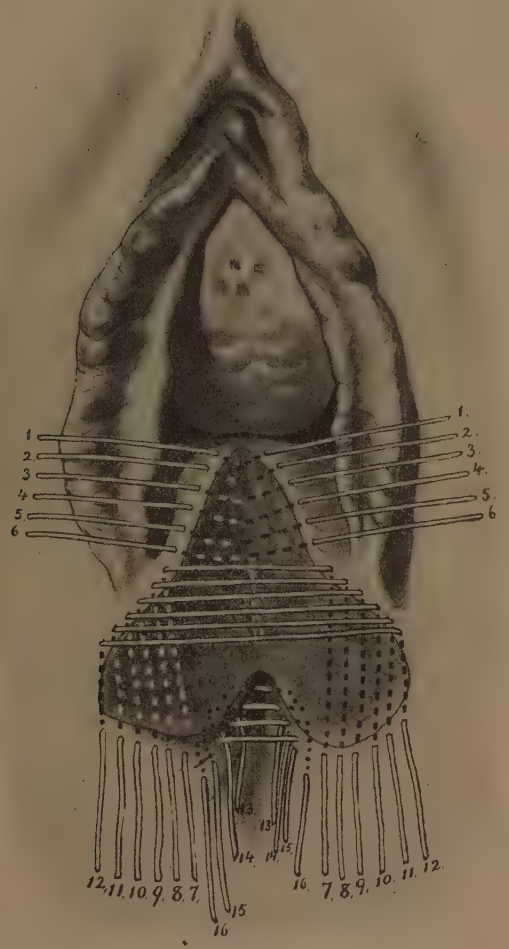


Fig. 238.—Hildebrandt's Method of Suturing.

in a bar and secured by shot. The two quills or bars served for all the sutures, while the skin edges were united by superficial sutures. The suture caused so much pain that it has been largely discontinued.

A slight exaggeration of the denudation just described can be applied to the restoration of a complete laceration. The sutures must then be vaginal, rectal, and perineal. The latter are introduced after the former are placed. The rectal sutures of catgut are brought out into that canal. Care must be exercised in the introduction of the first perineal suture that it shall accurately bring the ends of the sphincter ani in apposition.

Garrigues modified the Hegar operation by the following procedure (Fig. 233): According to the extent of the laceration and relaxation of the vagina and perineum, the vagina is seized with a double tenaculum at a point in the median line more or

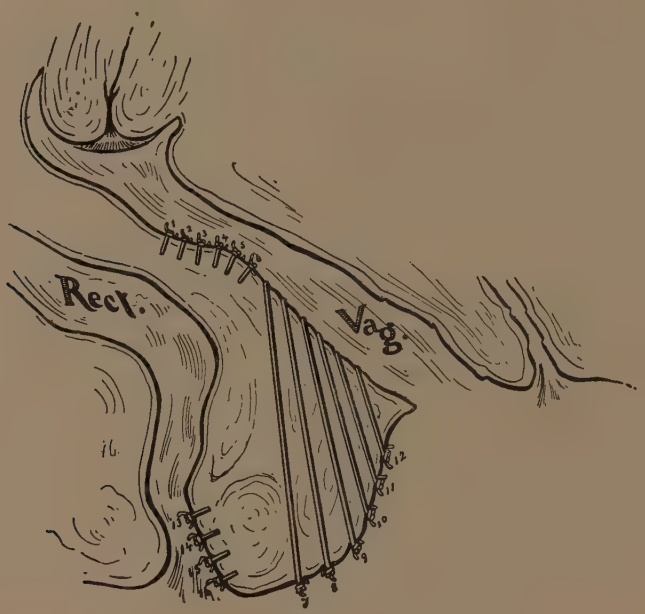


Fig. 239.—Hildebrandt Suture Closed.

less removed from the cervix. A point upon each labium majus is secured at such a distance from the clitoris as to permit of coition. The parts are rendered tense, the points are connected by an incision, and the intervening triangular surface is denuded. This denudation is carried downward to the margin of the skin and mucous membrane. With the vulva separated, the denudation presents a triangular surface.

The denudation is most rapidly accomplished by introducing one blade of curved scissors beneath the membrane at the point determined upon in the one labium and carrying it around the vaginal outlet to a similar position opposite. The central part

of this incision is picked up with forceps, cicatricial bands cut, and the finger pushed beneath this flap to the desired height. The tissues are pushed off laterally, and the triangular section is removed. It has the advantage that it is more than a denudation. It is a resection, and, therefore, permits the more accurate union of fascia and muscular structure.

The sutures are introduced from above downward, about six millimeters apart, deep and superficial alternating, the latter

Fig. 240.—Heppner's Figure-of-8 Suture.

passing only through the edges of the mucous membrane. The four upper sutures are transverse; the remainder dip downward at the central portion, and, when tied, lift up the relaxed wall. The sutures are thus introduced and tied one after another until the remaining denuded surface forms an ellipse, the upper and lower borders of which are of equal length. (Fig. 234.) Then a silkworm-gut suture (10) one centimeter above the posterior commissure is carried deeply beneath the wound

two-thirds the width of the denudation, and emerges at a similar point upon the opposite side. A second suture (11) is inserted midway between this suture and the outer margin; passing beneath the denuded surface it emerges upon the vagina to the left of the median line, is reintroduced, and comes out equally distant from the first suture upon the right side. The last suture, introduced near the extremity of the denuded surface, appears in the vagina midway between the second suture and the external denuded angle, reenters upon the op-

Fig. 241.—Martin Suture to Close the Rectal Opening.

Fig. 242.—Martin Suture Continued.

posite side, and emerges upon the right labium. These three sutures are all introduced and the surface is irrigated, when they are secured.

In my judgment, the employment of the continuous chromic catgut suture is far more satisfactory. It can be so introduced as to lift up the pelvic floor, and should include the edges of the levator ani muscle and the overlying fascia. If the floor is much relaxed, the muscle and fascia can be sutured separately and the mucous surfaces be closed over it with a con-

tinuous suture. This method of suturing greatly expedites the operation and has the advantage that it leaves no sutures (Fig. 235) to be removed.

Lauenstein's Method of Suturing.—This method of introducing the sutures was devised to prevent their infection by the rectal and vaginal discharges. The sutures, of catgut or fine silk, are introduced in the bleeding surfaces, including about five millimeters of the tissue intervening between the

Fig. 243.—Denudation for Freund's Operation.

borders of the rectal and vaginal mucous membranes respectively. (Fig. 236.) These are necessarily buried sutures. The remaining portion of the denuded surface is closed by silver wire from the perineum. (Fig. 237.)

Hildebrandt makes the denudation trefoil in shape. (Fig. 238.) The sutures are for the most part cutaneous. The vaginal sutures are first introduced; next the rectal, and, finally,

the perineal. (Fig. 239.) This method of suturing obliterates dead space and decreases the danger of abscess.

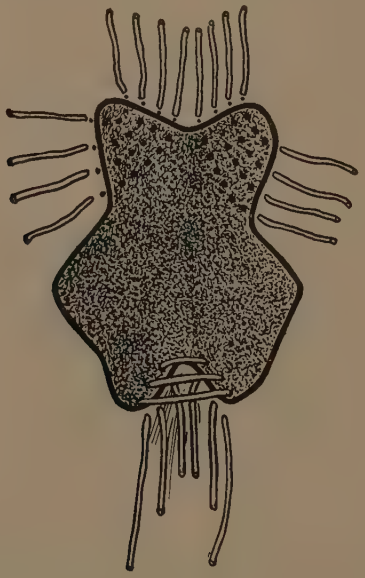


Fig. 244.—Sutures Inserted in Rectal Wall and Lateral Vaginal Angles.

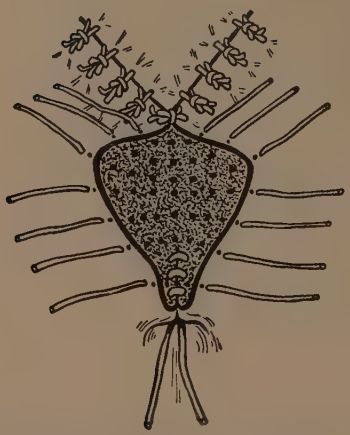


Fig. 245.—Vaginal Angles and Rectal Wall Closed. Suture in Place for Perineum.

Fig. 246.—Denudation Completely Closed.

Heppner accomplishes the same object with a figure-of-8 suture, which closes both vaginal and perineal surfaces. (Fig. 240.)

Martin more rapidly, and with a less complicated procedure, meets the difficulty. (Fig. 241.) He, with a continuous catgut suture, unites the intestinal wound from the rectal surface; when he reaches the anus, with the same suture in a contrary direction he superimposes a layer up to the superior angle of the vagina, and if the denudation is deep, a third layer before the vaginal and perineal surfaces are united. (Fig. 242.)

Freund has emphasized the necessity of securing such a

Fig. 247.—Emmet's Operation. Surface Denuded and Lateral Sutures in Place.

denudation as would reproduce the original appearance of the tear. This, if there is a cicatrix, which presents the appearance of oo, the laceration from which it has contracted may be represented by figure 243. He incises the posterior column of the vagina at a certain distance from the scar and carries the bistoury backward along the sides of this column, circumscribing the cicatrix in the vagina and upon the labia majora,

and completes the denudation as in an ordinary operation. The line which corresponds to the rectum is sutured, then each edge of the posterior vaginal column is united to the external margin of the denuded surface. The union of the lines forms the vulvar and perineal surfaces.

Emmet's operation is of especial value in relaxation of the posterior vaginal wall, and its purpose is to expose the fascia and so to introduce the sutures as to fold in the slack and lift

Fig. 248.—Emmet's Operation. Lateral Angles Closed and Perineal Suture Introduced.

up the perineum, bringing the parts more completely under the control of the levator ani muscle. With the labia separated by the hands of assistants, the summit of the protruding rectocele is seized with a double tenaculum; two other tenacula are placed one upon each of the caruncula, and a fourth upon the commissure of the vulva. When these are separated, they constitute a quadrilateral surface. These instruments are employed to render the parts tense, and the lines between

them are employed as the boundaries of the denudation. The intervening surface is completely denuded. (Fig. 247.) The sutures are then introduced in triangles, beginning in the sulcus

Fig. 249.—Emmet's Operation Completed.

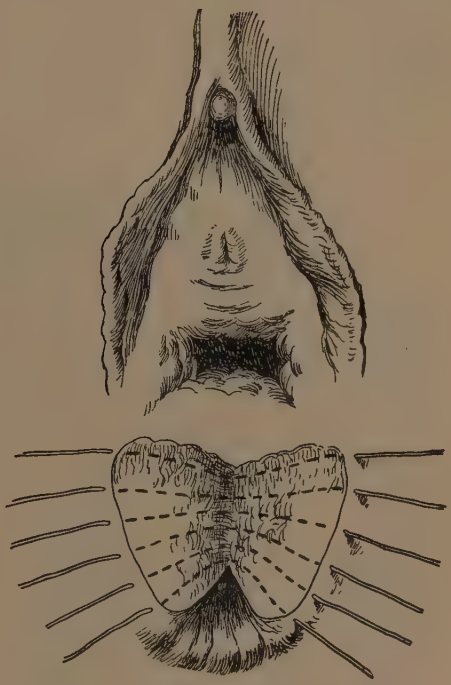


Fig. 250.—Emmet's Operation for Complete Laceration.

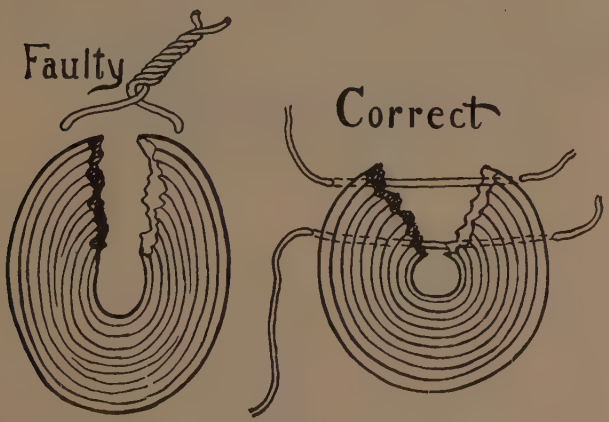


Fig. 251.—Suture to Unite the Ends of the Sphincter.

upon either side. The sutures introduced form a double triangle; a suture joins the summit of denudation upon each side with the apex of denudation of the posterior column. This is called the crown stitch. (Fig. 248.) A number of perineal sutures are then used. By this method the majority of the sutures are within the vagina. The tying of the sutures lifts up the pelvic floor and brings the posterior segment of the pelvic floor more closely in contact with the anterior. (Fig. 249.)

Fig. 252.—Outerbridge's Suture.

Noble modifies this operation by carrying his denudation higher upon the posterior column, by splitting the fascia and exposing the levator ani muscles. In suturing, he pulls out the muscle and secures it with not only the lateral, but also the central sutures, or those below the crown suture. This brings the muscles in contact in front of the rectum and insures a strong support to the pelvic floor.

Emmet's operation for complete laceration has for its first and principal aim the restoration of the sphincter ani. The first suture is introduced and brought behind the ends of the torn sphincter, which have been carefully exposed in the denudation. (Figs. 250 and 251.) As the suture is drawn up and secured, the precaution is taken to draw up and place in position the ends of the sphincter, so that they may be firmly secured. The remaining sutures appose the denuded surface of the perineum.

Fig. 253.—Cleveland's Suture.

Fig. 254.—Denudation for Martin's Operation.

Outerbridge modifies Emmet's operation in that he uses but three sutures. The first, of medium-sized catgut, by means of a needle threaded with a carrier loop, is passed from the end of the central undenuded portion to the summit of the lateral denudation upon either side. It is thrown over the pubes and a silver wire suture is passed from the highest point of the denudation upon one labium majus beneath the whole wound across to the corresponding point upon the opposite side. (Fig. 252.) The catgut suture is now tied and its ends are passed

downward to penetrate the skin upon each side one centimeter from the lowest point of the denudation. This suture tied, the silver wire is secured. The latter suture is removed upon the eighth day.

Cleveland uses a figure-of-8 suture of catgut. (Fig. 253.) The first suture enters the skin six millimeters from the wound margin and midway between the posterior commissure and the summit of the denudation in the left labium, passes deeply across

Fig. 255.—Dudley's Operation with Interrupted Sutures.

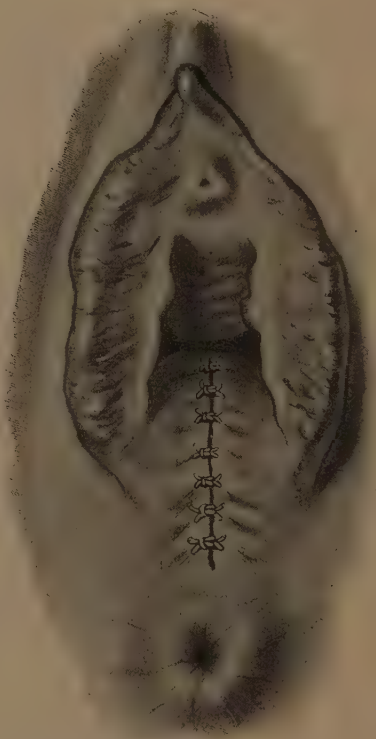


Fig. 256.—Dudley's Operation Completed.

between the denuded surface and rectum, embracing the muscles, and emerges upon the right labium six millimeters from the wound margin and midway between the posterior commissure and the point corresponding to its entrance, is reintroduced at a similar point upon the left labium, and emerges upon the right, directly opposite its original entrance.

The second suture follows a similar course. It enters the left labium near the summit of denudation, is buried beneath the

edge of the denudation to the center of the vaginal column, then passes downward, and emerges upon the right labium midway between the summit of denudation and the exit of the first suture. It is introduced upon the left labium at a corresponding point, passes across its former course, follows the border of the right sulcus, and emerges beneath the right summit.

A suture of wire or silkworm-gut, for support, is passed through the left labium about eight millimeters above the

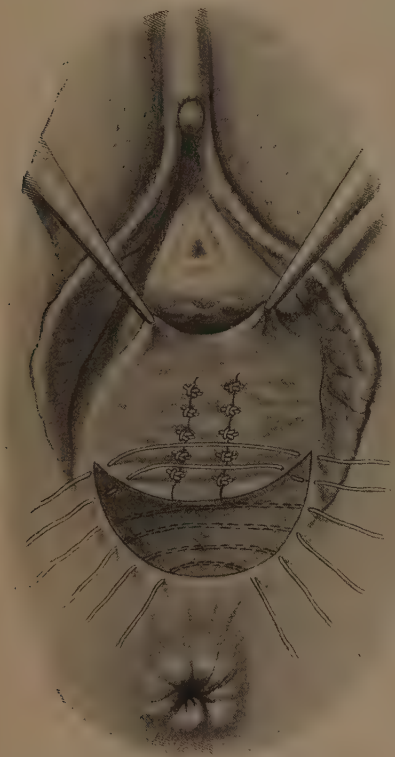


Fig. 257.—Vaginal Surfaces United; Perineal Sutures in Place.

Fig. 258.—Bischoff's Operation.

denudation, and about the same in the anterior vagina and the right labium.

A. P. Dudley makes a quadrilateral denudation with angles at the summit of the rectocele, laterally at the caruncula, and at the posterior commissure. The denudation removes only the mucous layer, preserving the submucous. (Figs. 255 and 256.) The finger is introduced into the anus and the first suture is

passed downward and forward to the median line, where it is brought out, reintroduced three millimeters from its exit, and carried upward and backward to emerge upon the other side of the vagina. This suture is tied, and acts as a fixed point from which to work. The remaining sutures, of juniper catgut, are made over and over and are introduced in a direction similar to the first, taking care to push up the rectocele with a director

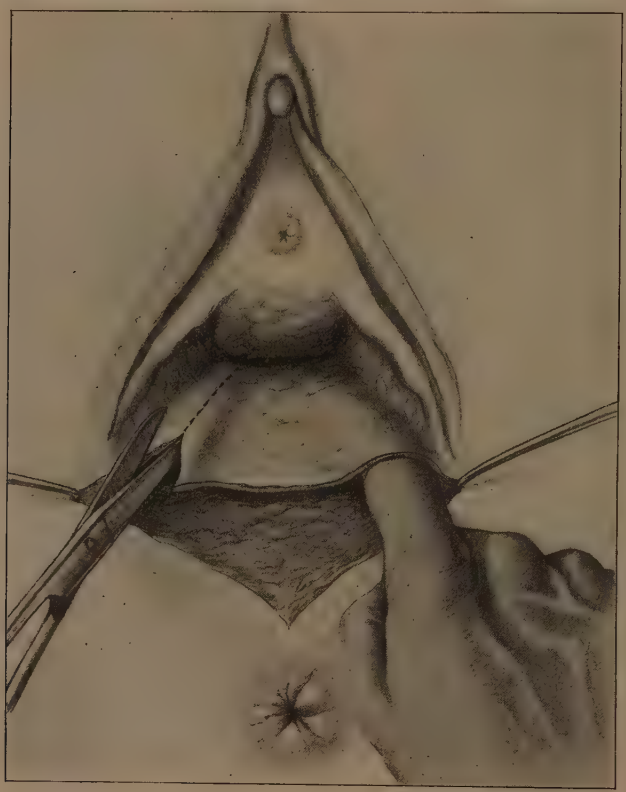


Fig. 259.—Splitting Vaginal Wall Preparatory for Suture.—(*Andrews.*)

as each stitch is tightened. As the outlet is approached the angle of the sutures is decreased, until, when abreast of the hymen, they are passed transversely. At this point the inside work is finished and the suture is made fast. A number of buried sutures are passed through the fibers of the separated central tendon. These extend to the extremity of the rent, when, with a continuous suture, they return to the point where the deep sutures began. After examination of the wound for bleeding points or

gaping of the surfaces, the wound is dusted with iodoform, and is not disturbed for four days.

Martin, in extensive relaxation of the pelvic floor, supplements the operation upon the vulvar outlet by a denudation of the lateral columns of the vagina, leaving a tongue-shaped, undenuded strip in the median line of the vagina. (Figs. 254 and 257.) Each lateral denudation is obliterated by continuous

Fig. 260.—Introduction of Suture in Retracted Flap.—(*Andrews.*)

suture, after which the outlet is closed with transverse sutures. (Fig. 257.)

Bischoff dissects up a flap from the posterior vaginal wall, which he utilizes in covering over the line of vaginal union. The perineal sutures are passed deeply beneath the flap. (Fig. 258.)

In the incomplete lacerations with relaxation of the pelvic floor the aim of the operative procedure is to take up the slack in the vaginal wall and restore the support to the suprajacent

viscera. Andrews, of Chicago, does this by first dissecting a small triangle pointed below by a line drawn across the vagina between the carunculæ myrtiformes and below by the muco-integumental border; second, at the outer angle of this triangle on each side, a finger is pushed beneath the mucous membrane to just beneath the cervix. This line is incised on each side, permitting the central flap to contract (Figs. 259, 260, 261); third, from the side of the cervix a suture is introduced through

Fig. 261.—Suture Tied; the Remaining Surface to be closed by Transverse Sutures.—(*Andrews.*)

the wall, carried as a submucous stitch around the central flap already designated, and tied. This folds the flap beneath and behind the cervix. This suture straightens or smooths out the posterior vaginal wall. The remaining portion is united by transverse sutures. Harris, of Chicago, seeks to utilize the pubo-perineal portion of the levator ani to hold the posterior segment of the vagina against the anterior by dissecting down

upon the muscle upon each side, excising a section, and uniting the cut surface. The fascia has been denuded over the posterior segment and sutures are at once inserted posterior to the retracted muscle.

Flap Operations.

Tait's operation is the representative for the various flap operations. In incomplete tears the rectum is tamponed with

Fig. 262.—Outline of Flap to be Turned Down to Form Raw Surface for Union. Flap thus formed to protect from fecal infection.—(*Restine.*)

a sponge or with cotton or iodoform gauze covered with vaselin and furnished with a thread. While an assistant separates the vulva, two fingers are passed into the rectum, rendering the posterior wall tense. To form the flap, Tait uses pointed angular scissors. The point of one blade is inserted in the median line at the mucocutaneous junction, and the recto-vaginal septum is split to the depth of two centimeters, first

to the left and then to the right, and is carried forward upon each side to the point at which he wishes the posterior commissure to be. (Figs. 264, 265, and 266.) This forms a semicircle following the mucocutaneous junction. The flap is drawn up by tenacula and further separated to the required depth. On the borders the incision is carried deeply into the cellular tissue of the perineum and labium majus. Bleeding

Fig. 263.—Flap Turned Down. Sphincter Closed and Sutures Introduced. —(*Ristine.*)

is controlled by forceps, and later by the pressure of the sutures. The sutures are passed with the fingers in the rectum as a guide. They pass transversely across the wound, the skin not being included. Four sutures are generally sufficient. The sutures are secured after the wound has been washed with sublimate solution (1 : 1000) and the tampon has been removed.

Sänger closes the skin edges with superficial sutures.

In *complete laceration* the rectovaginal septum is split, forming a rectal and a vaginal flap, depending in extent upon the depth of the tear. Sänger advises that it be made with the bistoury. These flaps are loosened at either extremity by prolonging the incision upward just within the labia, and downward alongside the anus, thus forming a letter H, the transverse bar of which is formed by the split in the septum, and is at the lower part of the letter. These flaps, when separated,

Fig. 264.—Incision for Tait's Operation for Incomplete Laceration.

form a quadrilateral. Great care must be exercised in the introduction of the first suture, which must include the ends of the sphincter ani.

Ristine, of Knoxville, Tenn., in complete laceration of the perineum, begins in the vagina and dissects a flap downward to the rectovaginal margin of the tear. This flap is made sufficiently long to insure its projection beyond the anus. The

divided ends of the sphincter ani are exposed and united with silkworm-gut sutures. (Figs. 262 and 263.) The flap is fastened over the line of union and serves to protect it from infection. This flap can be clipped off at a later date after it has completely served the purpose for which it was constructed. The same object is secured by Noble, of Atlanta, who loosens and draws down the anterior wall of the rectum. The tag of tissue thus formed subsequently contracts.

Fig. 265.—Line of Incision for Tait's Operation for Complete Laceration.

Fig. 266.—Appearance of Surface after Formation of Flaps.

Simpson's method is somewhat similar to Tait's in the manner of forming the flaps, but they are sutured separately, forming the anterior wall of the rectum and the posterior wall of the vagina, while the intervening funnel-shaped raw surface is united by sutures. (Figs. 267 and 268.)

Fritsch's procedure still more closely resembles Tait's in the splitting of the flaps. (Figs. 269 and 270.) He detaches

the rectum from the vagina, adds a lateral incision for the sphincter when its ends are retracted, and unites these with a provisional stitch, which serves during the operation to restore the shape of the orifice and to permit the accomplishment of reunion. He unites the rectum with catgut, using the Lauenstein suture. The same suture is used to close the vagina,

Fig. 267.—Outline for Simpson's Operation.

and the perineum is completed by suture in superposed planes or by continuous catgut sutures in terraces.

Alexander Duke, after introducing the left index-finger nearly its entire length into the rectum, with a double-edged bistoury penetrates the septum a distance of six centimeters; as the knife is withdrawn he enlarges the incision laterally to five centimeters. As the lateral ends of the incision are

pressed toward each other a lozenge-shaped opening appears. The sutures are introduced with a strong, sickle-shaped needle with eye in point, and silver wire is preferred for the suture. The needle is introduced just beyond the end of the incision, and, guided by the finger in the rectum, is made to encircle the incision, to be brought out beyond its opposite end. Drawing up this suture will give an idea of the number of additional

Fig. 268.—Sutures Introduced in Simpson's Operation.

sutures required. The sutures secured, the distance between the anus and the posterior commissure is considerably increased, with the formation of a thick perineal body.

304. After-treatment.—Immediately after operation cleanse the vulva with alcohol and water, equal parts, dry and apply a sterile gauze pad which should be retained with a T-bandage. The nurse should be directed to sponge the parts with the same

solution, whenever soiled. The patient is unlikely to suffer pain, unless the laceration has been complete, when a suppository of opium extract, gr. j, and hyoscyamus extract, gr. ½, can be employed. The urine should be evacuated spontaneously and the parts subsequently sponged, as already advised. The position of the patient may be changed, but she should be discouraged from making severe efforts. In incomplete lacerations the diet will not require careful scrutiny, but in the com-

Fig. 269.—Denudation for Fritsch's Operation.

plete it should be limited during the first week to animal broths, and subsequently for another week it should be restricted to articles that are easily digested. Secure an evacuation of the bowels upon the third day, and at least each alternate day subsequently. Exercise care that excessive purgation shall not occur. The sutures, if of silk or silkworm-gut, can be removed in from eight days to two weeks. Catgut sutures need not be disturbed. Observe care in the removal of the

sutures; the patient is preferably placed upon her side before a good light, and an assistant gently separates the buttocks, exposes the ends of the sutures and facilitates their withdrawal. Keep the patient in bed fully three weeks. After the fourth day the vagina may be irrigated once or twice daily with a disinfectant solution—sublimate (1 : 2000) or formalin (1 : 1500). Advise her to do but little walking for a month, and interdict coition for two months.

Fig. 270.—Catgut Sutures for Union of the Rectal Wall.

Fig. 271.—Incision for Duke's Operation.

305. Choice of Operation.—It should be understood that no operation is applicable to every patient. The operation should be adapted to the special condition. In incomplete tears, without rectocele, the Simon-Hegar operation is satisfactory. In patients with rectocele, Emmet's or Dudley's operation will serve an excellent purpose. In cases of complete laceration, without much relaxation of the pelvic floor, no

procedure presents so many advantages as that described by Tait and modified by Sänger. If the tissues are redundant

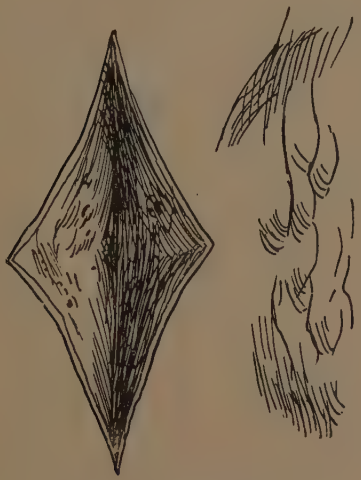


Fig. 272.—Incision Separated in Vertical Direction.

Fig. 273.—Incision United by Transverse Sutures.

and there is need to afford support, the operation of Emmet for complete laceration is the most acceptable.

INFLAMMATIONS.

306. The recognition of the development of the genital tract from the coalescence of the Müllerian ducts makes it evident that it is a continuous canal which must be especially vulnerable to infection and the manifestations of its results in an inflammation. In experience it is rarely found that the alterations due to infection are confined to a single portion of this tract. It must be admitted, however, that the special structure of certain portions of the canal renders it more susceptible to the influence of special micro-organisms and their products. The cylindric epithelium of the cervical canal is more vulnerable to gonorrheal infection than is the pavement epithelium lining the vagina. The recognition of the almost continuous uniformity with which the different parts of the canal become involved from the structure primarily infected, and the frequent difficulty in isolating the primary site, have caused me to depart from the usual order in the consideration of this subject, and to discuss infection and the resulting inflammation as affecting the entire genito-

urinary tract, and subsequently to consider the features of its local manifestations.

307. Micro-organisms as a Cause.—The most important exciting cause in the production of inflammation of the genito-urinary tract is the influence of micro-organisms. Inoculation of a mucous surface with a micro-organism may result in an immediate inflammatory reaction, which may subsequently extend to the neighboring structures by one of three ways: the mucous membrane, the lymphatics, or the blood-vessels. The original site of inoculation may be the vulva, vagina, uterus, or urethra, or the bladder surfaces, which are more or less exposed to external contact, or even the entire tract may be involved.

308. Natural Protection against Infection.—The situation of the genital tract, the injuries to which it is exposed, and the opportunities for its infection by various germs render the comparatively infrequent occurrence of inflammatory attacks surprising. The immunity against infection is to some degree secured by the difference in the character of the uterine and vaginal secretions. It will be remembered that the uterine secretion is alkaline, while that of the vagina is acid; consequently micro-organisms which would readily flourish in the one canal are unfitted for the invasion of the other.

309. How Immunity is Lost.—Any condition, then, which causes these secretions to be less antagonistic, or which leads the one to greatly preponderate, permits the activity of the germs and their products to become manifest. Lowered vitality, exposure to cold, menstruation, the increased flow after parturition, or abortion, all render the secretion more alkaline and establish a more uniform soil for the development of micro-organisms. Apparently normal conditions may be overcome at once when the tract has been inoculated with some virulent poison.

310. Inflammation and its Varieties.—Inflammation has been defined as an expression of the effort made by a given organism to rid itself of, or to render inert, noxious irritants arising from within or introduced from without. Inflammation may be acute or chronic, diffuse or circumscribed. It is denominated as acute when associated with pain, heat, burning, more or less swelling of the tissues, profuse discharge, and constitutional symptoms. Inflammation is chronic when the condition is somewhat protracted; the pain less severe or but slight; the discharge less in amount and less irritating to the surrounding structure, and with but slight constitutional reaction. Diffuse inflammation may involve the entire genital tract, as in streptococcic or gonococcic infection, either of which may extend the entire length of the genital canal, involving vulva, vagina, uterus, and tubes, and

even the ovaries, peritoneum, and cellular tissue. The latter form of infection may simultaneously invade the urinary tract, but circumscribed or local irritation confined to a portion of the tract is much more common.

311. The causes of inflammation should be divided into predisposing and exciting. The predisposing causes are those which produce congestion and disturbance of the normal equilibrium of the tract and, consequently, promote a favorable condition for the inception of infection. They may arise from disturbance of menstruation, and involution, and from traumatism. The first includes the improper hygiene of menstruation, exposure to cold, fatigue, overexercise, and excessive sexual relation during the congestion immediately preceding or following menstruation. Not infrequently persons, to avoid the inconvenience of menstruation, will take a cold bath, with a view to its arrest. A prolific cause is neglect or imprudence following an abortion, miscarriage, or parturition. The natural congestion consequent upon these periods is enhanced by exposure, which permits infection by various micro-organisms, with the resultant interference of the normal physiologic results in inflammation and interference with the normal processes and the subsequent development of inflammatory changes. Uncleanliness or want of care upon the part of physician or nurse in a manipulation during or following labor or an abortion, or in the use of the uterine or vaginal douche; upon the part of the patient in handling the parts with unclean hands; the act of masturbation or the employment of unclean instruments; the retention within the uterus or vagina of portions of placenta, decidua or blood-clots following abortion or labor; the presence of foreign bodies, such as tampons, tents, stem pessaries, and especially soft-rubber pessaries, which are very prone to become foul, can properly be considered as causes. Traumatisms, including lacerations of the perineum, vagina, and cervix, from the unskilful management of abortion or parturition, rough or unskilful examination, careless use of the sound or intrauterine manipulation, without asepsis, and excessive or violent coition, are also contributing factors. Chemic and vegetable poisons, such as phosphorus and the essential oils, may cause acute metritis. A patient suffering with chronic inflammation may have acute attacks which are excited by overexertion, sexual excess, operations, or rough examinations. Inflammation may be promoted by the presence of uterine displacements, pelvic or uterine tumors, or profuse inflammatory exudates or morbid processes. The exciting causes are the pathogenic micro-organisms and their products. They are the gonococcus, the streptococcus pyogenes, the staphylococcus pyogenes aureus and albus, the

bacillus coli communis, the bacillus tuberculosis, and the saprophytes from the bladder, rectum, and colon.

Inflammation of the vulva and vagina can be produced by the passage through them of a septic discharge from a sloughing fibroid, by malignant disease of the cervix or uterine body, by the contents of a pelvic abscess or pus-tube, or by the contact of feces or urine through fistulæ.

Of the various exciting causes named, the most prolific is gonorrhea. In woman gonorrhea is far more dangerous than syphilis, for when infection once occurs, the entire genito-urinary tract may become involved, and the individual subsequently suffers from chronic inflammation of the uterus, suppuration of the tubes, inflammation of the peritoneum and ovaries, as well as cystitis, ureteritis, and inflammation of the pelves of the kidneys. She not only loses through its influence her power of reproduction, but develops inflammatory conditions which, if they do not cause a fatal termination, produce such destructive changes in the pelvic organs as to necessitate their removal in order to prolong life or render it endurable. When gonorrhea has not established sterility, its existence, however, affords a favorable soil for the development of sepsis subsequent to abortion, parturition, or rough and unskilful manipulation. Careless examination, the introduction of the sound, and other intra-uterine manipulation without thorough asepsis are too frequently the causes of extension of serious pelvic inflammation.

Acute exacerbations are readily produced by overexertion, fatigue, cold, or rough manipulation when the pelvic organs are the seat of chronic inflammation.

312. Characteristics of Inflammation.—It should be well understood that inflammation, in the great majority of cases, is primarily a product of infection, and, consequently, is not necessarily to be regarded as a reprehensible process, but, on the contrary, as an effort to guard and preserve the structures from injury and invasion. Its first aim, then, is defensive; the second, constructive and reparative. These processes are often so intermingled as to render differentiation difficult.

The defensive element is more marked in the acute process, and is associated with proliferation, degeneration, and destruction, dependent in degree upon the virulence of the infection and the capabilities of resistance. Efforts are made to establish a retaining wall. Blood stasis, cell proliferation, and exudation occur; degeneration and destruction follow. Such a process causes pain, a burning sensation, elevation of temperature, extreme sensitiveness, swelling, and more or less constitutional reaction. The process may terminate in resolution or go on to suppuration.

Acute and chronic inflammation are ofttimes mere stages in the infective process, and the one insensibly fades into the other. In the latter, defensive action is slight and not marked by an extensive limiting wall. Naturally, the symptoms are less severe, and, as the constructive elements predominate, as seen in hyperplastic conditions, the neuropathic disturbances are more marked.

The inflammatory process may begin with a chill, or with repeated rigors, associated with elevation of temperature, and with tenderness over the pelvic organs, often so great as to render the contact of the clothing or bed-clothes quite unendurable, especially when the peritoneum has become involved. Increased secretion and discharge is an invariable symptom, necessarily dependent upon the seat and character of the inflammation. Disturbance of the functions of the genital organs also necessarily occurs. In acute attacks the organs are so sensitive that a digital examination is frequently attended with agonizing pain.

The menses may be arrested (amenorrhea) or be greatly aggravated (menorrhagia), while not infrequently there is profuse irregular bleeding (metrorrhagia). Increased or irregular flow is more likely to be associated with involvement of the peritoneum and cellular tissues, because the resulting exudate obstructs the pelvic venous circulation. The bleeding occasionally is internal. More frequently, however, there is a transudation of serum and plasma into the cellular tissues, which forms the condition known as parametritis or pelvic cellulitis.

313. Classification of Inflammation.—Frequently inflammation will begin in one portion and rapidly involve the structures of the entire genito-urinary tract; therefore, it is difficult to specify any particular organ as its primary site. Furthermore, in other cases the virulence of the micro-organisms may be so great and the defensive power of the patient so slight that general infection takes place, and localization, if it occurs, may be in organs remote from the site of original infection. The gonococcus is an example of the former, while infection with the streptococcus illustrates the latter. In the majority of cases inflammation preponderates in a portion of the genital canal or pelvic structure, and is named for the part mostly affected.

Inflammation of the	vulva,	vulvitis.
" "	ducts and glands of Bartholin,	Bartholinitis.
" "	urethra,	urethritis.
" "	bladder,	cystitis.
" "	vagina,	vaginitis.
" "	uterus,	metritis.
" "	tubes,	salpingitis.
" "	ovaries,	ovaritis or oophoritis

A still more minute classification of inflammation is made in relation to the particular structure or portion of the organ involved, as, the mucous membrane, the muscular structure, or the periphery. Thus, with the vagina we may have an endovaginitis, a parenchymatous vaginitis, and a peripheral or perivaginitis. The uterus furnishes an endometritis, a parenchymatous metritis, a perimetritis, the latter involving the peritoneal covering, and an inflammation of the cellular tissue, known as parametritis or, better, pelvic cellulitis. The tube is affected by endosalpingitis, parenchymatous salpingitis, and perisalpingitis. Inflammation of the serous covering of the uterus, as announced, is called perimetritis. It is, however, rare to find this portion of the peritoneum alone involved. More frequently, the entire pelvic peritoneum, including that of the uterus, broad ligaments, and tubes, is inflamed, so that the term pelvic peritonitis affords a more accurate description. Inflammation of the pelvic peritoneum rarely occurs without more or less inflammation of the cellular tissue. It can not be denied that we may have cellular inflammation without very extensive involvement of the enveloping peritoneum. When this occurs, it is known as pelvic cellulitis.

314. Vulvitis and its Varieties.—Inflammation of the vulva varies in degree from a slight erythema to a very severe and destructive involvement which may result in the formation of an extensive abscess, or in the destruction of a large portion of the labium. It is usually divided into simple or catarrhal, follicular, venereal, eruptive, phlegmonous, and diphtheritic.

315. Causes.—Vulvitis is generally produced by infection. Its development is favored by neglect of cleanliness. The accumulation of secretion from the sebaceous and sudoriferous glands; the decomposition of the smegma, which accumulates between the labia majora and labia minora and beneath the prepuce of the clitoris, will often cause an attack of inflammation similar to balanitis in the uncleanly male. In obese women the decomposing perspiration, frequently associated with vaginal discharges, will keep the surfaces constantly irritated.

The tendency to the condition is enhanced by the gouty, rheumatic, and scrofulous diathesis, and by intemperance in eating and drinking, especially the latter. Vulvitis is often produced by uterine and vaginal discharge, from malignant disease or from discharging abscesses.

The continual soiling of the vulva with the urinary and fecal discharge as a result of fistulæ is productive of vulvar inflammation and often erosion of the surfaces. Vulvitis is excited and aggravated by masturbation, and excessive coition, from the pruritus occasioned by the presence of pin-

worms, ants, and pediculi. The various eruptive diseases, as eczema, herpes, acne, furuncle, warts, and venereal sores, are productive causes. A severe form of vulvitis is generally associated with eczema, and intense pruritus is caused by the presence of the torulæ cerevisiæ in diabetic urine. Inspection will reveal whitish tufts over the surface, which arise from the spores of the oidium albicans. Severe vulvitis with eczema should always lead to examination of the urine in order to exclude the presence of sugar. Vulvitis is a frequent complication in the eruptive and infectious diseases of childhood, such as scarlatina and diphtheria. It may arise from the extension of inflammation from the anus or bladder.

316. Vulvitis—Simple or Catarrhal.—In the acute stage of *vulvitis* the labia minora, the clitoris, and the fourchet are swollen and thickened. The parts are red, angry, and dry; later, they are covered with a profuse purulent discharge of an extremely offensive odor. This discharge is produced by an increased secretion of the sebaceous glands mixed with desquamated epithelium and pus-corpuscles.

Pruritus, as in all forms of vulvar inflammation, is a marked symptom, and is at times so severe as to prevent sleeping and force the patient to abjure society. The temptation to scratch or rub the parts becomes almost irresistible. The contact of the urine causes smarting or burning. As the disease becomes chronic, the surface is not so bright a red; it becomes abraded; at points, small ulcers form, the skin is greatly thickened, the papillæ become hypertrophied, bleed easily, and are red; often the surface presents points of excoriation, which extend upon the vulva into the groins and the inside of the thighs, when the itching is intolerable. The glands in the groin often become swollen, and may even undergo suppuration.

317. Follicular Vulvitis.—The follicular inflammation is limited to the hair follicles or originates in the sudoriferous and sebaceous glands. The surface of the vulva is studded with small round protuberances the size of a millet-seed or hemp-seed. These elevations begin as papules, which may suppurate, forming pustules, which burst and shrivel, or they may remain as small indurations. The intervening skin is unaffected.

318. Venereal Vulvitis.—Venereal inflammation of the vulva is produced by gonorrhea, syphilis, and chancroid. The former is the most prolific source. Gonorrheal vulvitis is much more intense than the catarrhal. It particularly involves the vestibule and smaller labia. The latter are very red and edematous, while the external meatus of the urethra and the orifices of the ducts of Bartholin are generally red and swollen.

Small excoriations frequently occur which bleed easily. The disease is attended with a very profuse purulent secretion, in which the gonococcus is found. The microscope shows the subepithelial tissue exceedingly vascular and infiltrated with solid groups of round cells. The epithelium will be seen in varying stages of granular degeneration and desquamation. Gonococci penetrate the epithelium and are found in the underlying tissues. The inflammation extends to the vagina, not

Fig. 274.—Follicular Vulvitis.

infrequently through the urethra to the bladder, and often Bartholin's glands are inflamed, occasionally resulting in abscess formation. Micturition is followed by intense burning. Vulvitis due to syphilis occurs in the form of a single sore with indurated base and excavated surface, which is situated upon the large or small labium or in the neighborhood of the clitoris. In the secondary stage there are mucous patches similar to

those found in the mouth. Chancroids produce a more or less extensive ulceration, generally involving adjoining surfaces; syphilis causes indurated enlargement of the inguinal lymphatic glands, while chancroid is characterized by their inflammation and suppuration, causing the formation of buboes.

319. Eruptive Diseases of the Vulva.—Skin diseases manifest the same characteristics when situated upon the vulva as in other portions of the body. The most important, because the most frequent, are eczema, erysipelas, and herpes.

Eczema generally begins upon the labium majus or upon the mons veneris, from which it extends to the thighs, perineum, anus, and over the buttocks. In the acute stage the surface becomes red and swollen, burns, and is covered with transparent vesicles the size of a pinhead. It is associated with fever, gastric irritation, and rheumatic symptoms, and becomes chronic by the end of the second week. Chronic eczema generally appears in the form of eczema rubrum and the surface is covered with pus, dry scales, or crusts. Fissures form at the fourchet and anus and in the genitocrural folds. All the symptoms are greatly aggravated at the menstrual periods. Pruritus is intolerable. The occurrence of eczema of the vulva is generally associated with the appearance of the disease upon other parts of the body. It is a frequent consequence of diabetes mellitus, owing to the irritation of the sugar-containing urine. It is also an outcome of the rheumatic diathesis.

Erysipelas may occur as a primary affection of the vulva in the new-born, when it is a very serious disease, frequently proving fatal. It occasionally occurs periodically with the catamenia, or may even take the place of the latter. Its occurrence during the puerperal state is generally an indication of serious infection.

Herpes manifests itself by the appearance of small transparent vesicles, from the size of a pinhead to that of a pea, which may be few or multiple, discrete or confluent; rarely, as a single erosion of large extent. The advent of the disease is characterized by heat, smarting, and an area of redness, which is covered with agminated vesicles. These vesicles may fuse, and form a large bulla. The vesicles dry; the edges of an ulcer are scalloped and its surface is covered with a crust, beneath which cicatrization is completed within from eight to fifteen days. The inguinal glands are engorged and painful, but do not suppurate.

Causes.—Accidental herpes is caused by syphilis, gonorrhea, filth, and constitutional conditions. Congestion is a predis-

posing cause. In some it occurs each month two days in advance of menstruation; also during pregnancy.

320. Phlegmonous Vulvitis.—Phlegmonous inflammation of the tissues may result from the catarrhal or may be the result of violence. It affects the deeper structures and subcutaneous tissues, resulting in serpiginous ulceration, which forms a permanent fistulous tract, or may terminate in the formation of an abscess.

321. Diphtheric Vulvitis.—Diphtheria may, but rarely does, affect the vulvar mucous membrane. The so-called diphtheric vulvitis is an exudation found upon lesions of the vulva and vagina, produced by parturition, and is the result of septic infection. Such exudations are also found in grave constitutional disorders, such as scarlatina, smallpox, and typhoid fever.

In a woman who succumbed to sepsis subsequent to the delivery of an intra-uterine sessile fibroid whom I saw prior to death, the vulva, vagina, and uterus were lined with a diphtheric exudate.

322. Diagnosis of Inflammatory Disease of the Vulva.—The diagnosis, especially the differential diagnosis, of the inflammatory disorders of the vulva is of great practical importance. Gonorrheal vulvitis is evident from the greater intensity of its symptoms. It is characterized by an increased burning during micturition, profuse purulent discharge, and redness of the meatus and orifices of the ducts of Bartholin. It has a tendency to extend to the tubes, ovaries, and peritoneum, as well as an increased inclination to involve the urinary tract. Its recognition is rendered certain by the discovery of the gonococcus, and the known fact of exposure to the virus. The absence of the gonococcus is not proof positive against the specific character of the disease, as the germ may have disappeared. (For method of discovering the gonococcus see Section 90.)

The production of vulvitis in the virgin by masturbation is suspected when the smaller labia and the space between them and the hymen are covered with small, pointed excrescences; the nymphæ are elongated; the clitoris or its prepuce is irritated; swelling of the shallow groove between the orifice of the urethra and the clitoris exists; clear, abundant secretion from the ducts of Bartholin occurs; and associated with these phenomena there is abnormal sensibility; exaggerated prudery; and distinct hysteric symptoms. Discontinuance of masturbation may be assumed when the hypertrophied nymphæ become soft and no longer show any indication of inflammation.

Eczema can be recognized by the similarity of its symptoms to those of the disease when it occurs in other portions of the body. Finding the cervix covered with whitish tufts should

arouse suspicion of the presence of torula cerevisiæ, which is confirmed by the microscope and the discovery of sugar in the urine. It is a good plan to carefully examine the urine in every case of eczema of the vulva. Herpes is frequently confounded with chancroid, from which it is distinguished by its early history. The formation of a vesicle is followed by its rupture, leaving a raw surface without a thickened inflammatory base and without loss of substance. The burning is more acute and the inflammatory symptoms subside more quickly. The lymphatic glands of the groin may become inflamed, but do not suppurate. The duration of herpes is from eight to fifteen days. In chancroid the sore has an uneven, fissured base, the edges of which are sharply defined, and its surface is covered with a greenish discharge. It presents points of abrasion, and generally the apposed surface becomes inoculated. Bubo develops in the groin.

323. Treatment.—In all forms of vulvitis absolute cleanliness is essential. In the simple acute variety, absolute rest and the administration of salines are indicated. Tincture of aconite can be given in drop doses every one or two hours to decrease inflammation. In all varieties thorough local cleanliness must be observed. In the simple and follicular forms cleansing and isolation of the inflamed parts will frequently be sufficient to establish a cure. The cause of the inflammation, if possible, should be determined, and, when practicable, remedial measures should be directed to its removal. Vaginal discharge should be arrested, and the inflamed surfaces should be protected from its contact. The rheumatic, gouty, and scrofulous diatheses and improper habits must be corrected by proper hygienic and constitutional measures. The food should be carefully regulated and all stimulating and indigestible articles avoided. Alcohol in any form should be interdicted, excepting in the diphtheric and phlegmonous varieties. In the acute stages a bland diet or exclusive milk diet may be advisable.

Catarrhal and Gonorrheal Vulvitis.—The treatment of these forms is of great importance, as infection may lurk in the diseased tissues for years. Cleanliness is secured by the employment of the hot sitz bath several times daily, by antiseptic fomentations, such as gauze pads moistened with sublimate solution, 1 : 2000 or 1 : 1000; carbolic acid, 1 : 20; boracic acid solution, 1 : 50, or a 5 per cent. solution of antipyrin, placed over the vulva and covered with oil silk or rubber dam. In very acute conditions the distress will be much more quickly ameliorated by the application of lead-water and laudanum. This application may be kept cold by an ice-bag placed over it. These applications, whether antiseptic or emollient, should be frequently

changed, the parts protected from vaginal discharge by a tampon, and the inflamed surfaces painted several times daily with a solution of Monsell's salt, 1 to 8, in glycerin; on each alternate day silver nitrate, gr. x to the fluidounce, or compound tincture of iodin in water, 1 to 2, should be used. Protargol, largin, argyrol, and argonin have been especially advocated as valuable in the gonorrheal form; alumnol in 2 per cent. solution has also been advocated. Ramon Guiteras highly recommends mercurol in 2 per cent. solution. These agents are more effective in the gonorrheal form. The sides of the vulva should be separated with absorbent cotton, surgeon's lint, or prepared cotton. After the subsidence of the more acute stage, the surfaces should be dusted with zinc oxid, bismuth subnitrate, iodoform, lycopodium, starch, talcum, or one of the various combinations of these powders. Iodoform and tannin in equal parts are very efficient. Equal parts of alum and sugar afford relief in pruritus. Buboes and abscesses should be promptly incised and their cavities sterilized. In chronic vulvitis, astringents or caustics may be employed, the latter with the purpose of promoting sufficient metabolism to take up inflammatory exudate which has led to thickening of the tissues. Benzoated zinc ointment is a soothing application. The surfaces may be dusted with calomel or bismuth subgallate. Gonorrheal vulvitis is usually secondary. In chancroid, the parts should be kept clean by frequent washing, the inflamed area isolated by gauze or lint, and drying powders should be employed, such as iodoform, iodoform and tannic acid in equal parts, aristol and desiccated alum, 4 to 1, calomel and zinc oxid and bismuth subgallate. In herpes, keep the surfaces clean and separated. Drying powders should be employed.

In *follicular vulvitis*, in addition to strong antiseptics, alkaline solutions are efficient. It may be necessary to shave the parts and to puncture and cauterize the individual follicles, or, in rare cases, to excise the affected surface. The ointment of ammoniated mercury, diachylon ointment, or ichthyol in lanolin ($\frac{1}{8}$–1 : 4) may be useful. *Phlegmonous and diphtheric vulvitis* require cleanliness, antiseptics, removal of sloughing tissue, and, in the latter, cauterization of the infected surfaces with strong carbolic acid.

Eczema, when acute, must be treated with emollient applications or starch poultices, and the surfaces should be carefully cleansed. The bowels should be regulated and constitutional measures employed for the correction of any disordered condition. When eczema is associated with diabetes, compresses of hyposulphite of soda, half an ounce to the pint, should be kept in contact with the inflamed surfaces. In chronic eczema, the

parts should be thoroughly washed with strong potash soap and hot water. By this measure all crusts and scales are removed. Where the surfaces are too much irritated, cracked, and fissured for this plan of treatment, a starch or slippery elm poultice may be applied. After thoroughly cleansing the surfaces, the application of the following ointments will prove of value:

℞. Hydrarg. ammoniat., ... ʒss
Lanolin, ... ʒij. M.
Ft. ungt.

℞. Iodoform, ... ʒj
Zinc. oxid, ... ʒij
Lanolin, ... ʒiij. M.
Ft. ungt.

Or diachylon ointment or one of the tar preparations may be employed. If the irritation is apparently kept up by a vaginal discharge, use a vaginal tampon. Laxatives should be given to regulate the bowels, and constitutional measures should be employed for the correction of arthritic, scrofulous, or diabetic conditions, from any one of which the disease may have originated.

324. Edema and Gangrene.—*Edema* of the vulva is frequently associated with pregnancy. It is common in ascites as a result of various obstructions of the circulation. It may follow labor and also result from varix of the external pudic vein. When one side of the vulva only is involved, infection should be suspected. Incisions of the vulva or spontaneous fissures permit the fluid to escape, but increase the danger of erysipelas, and may be followed by gangrene and sloughing of the labia. The swelling in general anasarca is very great, and may render urination or the use of the catheter very difficult.

A hard edema of one labium can occur from and persist after chancre. When it appears in the nymphæ or præputii clitoridis, it resembles elephantiasis. The condition is known as syphilitic hypertrophy of the vulva.

Gangrene of the vulva may be produced by traumatism, septicemia, and occur in weak and scrofulous infants. This form of gangrene in young children is known as noma. It is infectious, and presents a reddened, infiltrated labium, and an ichorous discharge. A vesicle appears, which rapidly becomes gangrenous.

The treatment of edema is the same as that of the condition from which it arises. That of gangrene or noma consists in early excision, disinfection, and the exercise of measures to secure effectual nourishment.

325. Bartholinitis (*Inflammation of the Glands of Bartholin*). —These glands—also known as the vulvovaginal, Duverney's

and Cowper's glands—are racemose glands the size of a bean, situated in the labia majora at the junction of the posterior and middle thirds. The duct, two centimeters in length, opens in front of the hymen, with an orifice the size of a pinhead. Catarrh of these glands is rare, but hypersecretion is not infrequent. It is indicated by redness about the opening of the duct, which may be either dilated or closed; in the latter case forming a retention cyst. The secretion from these glands may be thrown off in paroxysms, not infrequently in nocturnal emission. The secretion is particularly discharged during erotic excitement.

Inflammation can occur in either the gland or the duct. It is generally due to specific infection, but may arise from streptococcic or staphylococcic forms. In very severe cases it is apt to be a mixed infection. It is most generally due, however, to gonorrhea. Gonorrheal inflammation having been lighted up in the gland, it may subsequently remain dormant, and afford material which may not only again infect the patient, but others coming in contact with the secretion. Inflammation, according to its virulence, may either produce a cyst or result in the development of an abscess. Cysts are either single or multilocular, ovoid, with a smooth surface, and seldom transparent; the contents are viscid and are colorless or yellow. From mixture with blood they may become chocolate colored. The cyst varies in size from that of a nut to that of an egg, is generally unilateral, and is most frequently situated on the left side, elongated in the axis of the greater lip, and nearer the mucous surface. It seems elastic and compressible rather than fluctuating; gives rise to discomfort in walking and during coition, and can become inflamed and suppurate. Superficial cysts, involving the duct, may attain to the size of a nut; they are usually situated at the base of the labium minus, and may project into the vagina beneath the mucous membrane. A cyst of the gland is deep, is generally larger, and is located behind the labium majus; it elevates both labia and its duct is impermeable.

Fig. 275.—Cyst of Bartholin's Gland.

The diagnosis is readily determined. In either solid or fluid tumors fluctuation is absent, and the transparency is insufficient. But when the diagnosis is doubtful, it can be ascertained by puncture. The conditions with which it may be confounded are: first, sacculated cysts of old hernial sacs; second, hydroceles in the canal of Nuck; third, a cyst in front of a hernia. From hernia, which may be an epiplocele, an enterocele, or ovarian, it is distinguished by the absence of succussion in coughing, and by the determination of the connection of the mass with the abdomen. Hydrocele may frequently be displaced by pressure, is a larger tumor, gives more sensation of fluctuation, and is more translucent. Abscess may be secondary to the cyst or may originate from primary inflammation. Swelling and edema are marked over the posterior part of the vulva and about the anus, and the pain is acute and lancinating. The patient may have more or less fever; frequently, the urine is retained; fluctuation is distinct, and, if the abscess is not opened early, its contents may escape through several openings; pus is abundant and fetid. Fistulæ may persist, and may result in a rectovulvar fistula, or a large ulcer may be present, associated with purulent secretion, or a hypertrophic induration of the gland, with profuse discharge of milky, greenish pus. The gland is the last refuge of gonorrheal inflammation and is a frequent source of unsuspected infection for men. It may be confused with fecal abscess, phlegmon of the labium majus, or furuncles. In fecal abscess there is more rectal disturbance, a more widely diffused inflammation, and the mass does not encroach to the same degree upon the labium. In phlegmon of the labium majus the inflammation is more external, and encroaches upon the cutaneous rather than upon the mucous surface. Furuncles are more sharply defined and present an indurated base.

Treatment.—In early inflammation of the duct it may be injected with a one per cent. solution of silver nitrate after evacuation of the pus. The duct may be opened with a lacrimal knife and a crayon of silver nitrate or a solution of zinc chlorid (1 : 50) may be introduced. In cysts, when the contents are evacuated by puncture, they quickly reappear. Obliteration of the cyst may be secured by injecting ten drops of a solution of zinc chlorid (1 : 10) after the contents have been removed by aspiration, or the cyst may be incised and packed with iodoform gauze. A preferable procedure would be extirpation. In order to overcome the difficulty of removing the cyst when collapsed, it may be punctured, emptied, irrigated with hot water, and injected with melted paraffin, and the latter hardened with ice, after which the mass thus formed

is easily dissected. In abscess early free incision at the junction of the skin and mucous surface is important. To extirpate the gland, wash the cavity with carbolic solution and pack with gauze. In fistula it may be wise to extirpate and to close the cavity with catgut sutures.

326. Pruritus Vulvæ.—Pruritus is a symptom of all forms of inflammation of the vulva. It results from the presence of pediculi, pin-worms, eczema, trichiasis; from hemorrhoids, disease of the kidneys, ureters, bladder, and urethra; from the congestion of the pelvic organs and masturbation; and from acrid vaginal discharges. It is associated with pregnancy, menstruation, the menopause, old age, the gouty diathesis, and general nervousness. It is directly caused by lice, acrid discharges, and diabetes. In addition to the sources given, there is a form of pruritus in which the origin remains undetermined. This is designated as an idiopathic pruritus. It is, however, very questionable whether careful examination will not disclose a demonstrable cause of the disorder. Seeligman, in an investigation of a large number of cases, found in all a diplococcus, which resembles the gonococcus in appearance, but differs from it in its process of growth, and besides it takes the Gram stain.

Symptoms.—Pruritus produces intense itching, and, as a result of the scratching induced, excoriations are present, and the hair is often worn off the mons veneris. The patient avoids company, becomes melancholy, has loss of appetite and sleep and increased sexual desire, masturbation is excited, and she may become insane. Itching is continuous or occurs only at intervals, it is increased by heat, and is much worse at night or following any exertion. The relation of masturbation to pruritus is not always readily determined. The habit produces certain abnormal alterations as a result of the irritation: changes in the endometrium, glandular hypertrophy, ovarian irritation, increase of secretion, irritation and manipulation of the vulva. A bad circle is engendered; irritation causes masturbation, and this aggravates the inflammation. There are cases, however, in which most careful examination fails to disclose inflammation of the vulva as a source of the intense pruritus. These conditions are known as idiopathic pruritus, and are supposed to be due to nerve irritation. Such cases do not properly belong under the term inflammation of the vulva, but they are so rare, and the symptoms are so prominently associated with vulvitis, that their consideration seems more appropriate here.

Prognosis.—The relief of the condition depends entirely upon its cause. In some cases it is exceedingly obstinate.

The removal of the cause, as filth, pediculi, or pin-worms, results in the removal of the disorder. The prognosis in masturbating alterations is by no means favorable. It may be exceedingly difficult to overcome the evil habit.

Treatment.—The first aim in the treatment should be to discover and remove the cause. Upon the recognition of pediculi, the parts should be shaved, and blue ointment should be applied. A strong sublimate solution, however, is the most effective agent. The surfaces should be painted with a solution containing one grain of corrosive sublimate to the ounce each of alcohol and water. Unless the parts are shaved, this application must be repeatedly made, for it is necessary to destroy not only the lice which are present, but also the spores. If the pruritus arises from the action of the ascarides scabiei (the itch insect), sulphur ointment or thirty-five grains of betanaphthol in one ounce of vaselin are efficient applications. Of course, in the latter condition, the application must be made to the entire body.

The methods of treatment of eczema and vulvitis have already been given. When it is evident that the pruritus has been produced by pin-worms, the parts should be kept clean and the patient given fluid extract of senna and spigelia in half-ounce doses; a rectal injection of infusion of quassia, two ounces to the pint; half a grain of sublimate to eight ounces of water; an injection of lime-water or a suppository of five grains of santonin are also efficient measures. Hemorrhoids, glycosuria, and other causes should be recognized and treated. The diet is important. Alcohol and spiced food should be excluded. The use of coffee will often cause severe pruritus. Milk is an excellent basis for the diet. The general health should be carefully considered. Tonics, such as arsenic and quinin, should be administered. When the patient is unable to rest, sleep should be secured by the administration of bromid of potash, ʒj–ʒij daily, or tincture of cannabis indica, gtt. xx–gtt. xxv, thrice daily. When the measures just named are insufficient to secure sleep, sulphonal or trional should be given in preference to opium. Local vaginal injections of hot water; carbolized, sublimated, or borated cotton tampons; or fomentations of lead-water and laudanum can be employed, or a saturated solution of bromid of potash may be painted over the surface several times daily. Local applications of chloroform in glycerin (1 : 8), hydrocyanic acid, two or three drops to the ounce, or a one per cent. solution of cocain may be used. A solution of carbolic acid, or a strong solution of silver nitrate, followed by cold compresses, may be employed. Seeligman advocates the use of an ointment containing 10

per cent. of guaiacol in vaselin, and when this is not effective, it should be increased to 15 to 20 per cent. An ointment containing acetate of lead, chloral, camphor, or chloroform (a dram to the ounce), combined with vaselin or menthol, solid stick of nitrate of silver, or the galvanic current are advised. In very obstinate cases the affected skin may be excised. Tampons containing equal parts of sulphurous acid and boroglycerid sometimes afford relief. Tobacco smoking has given relief when all other means have failed.

Fig. 276.—Kraurosis Vulvæ.

327. Kraurosis vulvæ is an obscure form of disease, first recognized by Breisky, which consists of an atrophy of the smaller labia. The skin of the vulva undergoes essential changes. The capillaries of the corium become dilated, the rete mucosum becomes thin and disappears, while there is a substitution of a thick horny layer of epithelium, which lies directly upon the corium. The papillæ disappear, the undulating character of the skin is lost, and it becomes stiff and sclerosed, with here and there points of small cell infiltration. As the disease progresses the sebaceous and sweat-glands are entirely destroyed. It is called chronic inflammatory hyperplasia of the connective tissue with inclination to cicatricial shrinking (Peter).

Mars divides kraurosis into two stages: (1) The stage of edema, characterized by more or less inflammatory reaction; (2) the atrophy of elastic and connective-tissue skin layers with the formation of scar tissue, but Heller says it may be independent of the inflammatory process. He attributes it to some chemic irritation or a direct disease of the medullated

nerves, which leads to atrophy of the muscles, fat, and glands in the deeper layers of the skin, while a hypertrophic process, especially a hyperkeratosis, occurs in the superficial layer.

Causes.—The cause is unknown. It has been attributed to gonorrhea and pruritus. A preceding inflammatory stage exists (Martin). Breisky found it more frequently in the pregnant; Martin and others, in the nonpregnant.

Symptoms.—The surfaces become contracted, presenting a smooth cicatricial appearance, devoid of glands, with reddened, inflamed points, not fully cicatrized. Pruritus is intense and there is severe burning and pain upon urination. The surface is dry, smooth, contracted, often fissured. The labia minora entirely disappear and the clitoris becomes a mere papule. The vulvar orifice is contracted, and causes coition to be exceedingly painful, often impossible. Childbirth results in extensive laceration.

Diagnosis.—The scratching of this disease should be separated from that of onanism and pruritus. The gratification induced by masturbation and the absence of cicatricial changes distinguish it. In pruritus the tears and superficial injuries are more marked and the disease is not so general, while in kraurosis the border of disease is more sharply defined toward the healthy skin.

Prognosis.—Its spontaneous recovery is very doubtful. That carcinoma occasionally develops from it is exceedingly probable.

Treatment.—The disease is exceedingly intractable to treatment. The application of cocain adds to the discomfort. Relief has been afforded by applications of strong carbolic acid, or of pledgets wet with a solution of lead acetate. The thermocautery has been applied. The most effective treatment is the excision of the affected tissue, accomplishing union of the healthy tissue by sutures. Care must be exercised to prevent narrowing of the urethra.

328. Vaginismus is a term employed to represent an abnormal hyperesthesia of the external genital organs which produces muscular spasm. It is common in young, nervous, or hysteric women, and occasionally occurs without our being able to discover any source of irritation. Generally, a careful examination will disclose an irritable spot in the fossa navicularis; an inflamed and thickened hymen, which has failed to rupture, or when it has ruptured, irritable carunculæ myrtiformes; fissures in the fourchet or around the orifice of the vagina; small ulcerations within the hymen; fissure of the anus; urethral caruncle, or an irritable urethra. Nervous irritation of the vulva may be engendered by association with an impotent or partly impotent man.

Symptoms.—Dyspareunia, or painful coition, and sterility are the most marked symptoms. The slightest touch, or even the approach of the male, may cause powerful spasm of the sphincter vaginæ muscle. I have seen similar spasm occur at every attempt at urination in a very hysterical woman. The suffering is so intense as to lead the patient at once to seek medical advice, or through a sense of delicacy she may endure the distress until it becomes intolerable. She becomes careworn, anxious, and even hysteric. The ordinary vaginal examination is often extremely painful. I have, however, observed patients in whom the pain seemed confined to the attempts at coition, and they apparently experienced no unusual discomfort during a careful pelvic investigation. Before attempting digital examination it is well to carefully inspect the surfaces, and to push the labia apart, when possibly the cause will be discovered. Hildebrandt has described a form of vaginismus due to spasm of the levator ani muscles, known as superior vaginismus, which is responsible for that unpleasant complication, penis captivus. It must not be overlooked that dyspareunia is occasioned by pathologic lesions of the floor of the pelvis, such as prolapsed, inflamed ovaries and tubes, inflammation of the cervix, pelvic cellulitis, or peritonitis.

Prognosis as to cure is good.

Treatment.—The first essential in treatment must be the removal of the cause. When the hymen is thickened and sensitive, it may be necessary to cut it completely away. Its mucous surfaces, however, should be sutured, in order to preclude the formation of cicatricial tissue. In irritable fissure the base should be divided, as in fissure of the anus, or touched with the thermocautery. Local applications are often effective, of which one of the best is iodoform in powder or ointment. Its disagreeable odor, which often precludes its use, may be overcome by rubbing up a few drops of oil of eucalyptus with each ounce of the powder. Pledgets of cotton soaked in a four per cent. solution of chloral or in a two per cent. solution of carbolic acid are useful. Ointments of opium, belladonna, or ichthyol often afford relief. Neuromata, irritable carunculæ myrtiformes, and urethral carunculæ should be snipped off. In fissure of the neck of the bladder the urethra should be overstretched and cocain filaments or pencils should be used. In obstinate spasm glass dilators or plugs (see Fig. 149) should be worn for an hour night and morning. The pain caused by the introduction of the plug soon ceases, and it can be decreased by anointing it with a medicated ointment. These instruments should gradually be increased in size. When

the dilator can not be worn, recourse should be had to operation.

Sims divided the superficial fibers of the sphincter vaginæ—the bulbocavernosus muscle. With the patient anesthetized, two fingers of the left hand are passed into the vagina to stretch the ostium. An incision about two inches long is made on each side of the fourchet, extending from half an inch above the ostium to the raphe of the perineum. The ostium is thoroughly plugged with gauze, which is kept in position by a T bandage. This plugging is important to prevent hemorrhage. The gauze is removed the following day, after which the glass plug should be worn a portion of each day for several weeks.

For incision forcible stretching may be substituted. This is accomplished by introducing the thumbs (Tilt) or several fingers of each hand (Hegar) and forcibly separating them until the muscular fibers yield under the traction. This procedure affords the advantage that it is bloodless and that it leaves no granulating wound, to cause a cicatrix. The galvanic current has proved beneficial. Constitutional treatment should always be combined with the local measures. Quinin, arsenic, and strychnin should be given. Outdoor exercise and change of scene should be encouraged and complete sexual rest enjoined.

329. Vulvo-vaginitis is an inflammation of the vulva and vagina, most frequently found in young girls, and, in the great majority of cases, is believed to owe its origin to the presence of the gonococcus. Robinson,* in fifty-four cases of vulvitis in children, mostly under five years of age, was able to find cocci in the pus cells, which corresponded to the gonococci in forty-one. It may also be induced by want of cleanliness, by the decomposition of the natural secretions, and by the entrance of pinworms where proper cleanliness after stool is neglected. The importance of the condition is too frequently underestimated. The infection can extend to the uterus and even pelvic peritoneum, producing changes which condemn the individual to suffering all her menstrual life and often render her sterile. The principal symptoms are pruritus, painful micturition, and a profuse yellowish watery discharge, which constantly soils the clothing of the child, and keeps the vulva irritated. The intense pruritus may readily generate the habit of masturbation.

The infection may be spread by the hands, towels, linen, and bath. In children's asylums it is not uncommon to find large numbers of girls thus affected.

* "Tr. Lond. Obst. Soc.," Jan. 4, 1898.

The condition is frequently complicated by ophthalmia, peritonitis, and arthritis.

Treatment should be energetic. In the acute stage it consists in rest in bed, a light diet, and free evacuation of the bowels. The urine should be rendered bland, and cold applications should also be employed. Severe pain and burning can be obviated by local applications of cocain, several hot sitz baths, and careful irrigation two or three times daily.

In irrigation, cocain may be first applied. This can be followed by alkaline or antiseptic agents, potassii permanganate (1 : 4000 to 1 : 1000), silver nitrate (1 : 2000), protargol (0.5 to 1 per cent.). The irrigation should be made through a soft-rubber catheter introduced into the vagina. If the vagina does not drain well, the hymen should be stretched, to remove any obstruction. After irrigation, the parts should be dried and a mild ointment applied. The vulva should be covered with a sterile dressing, which should be burned upon removal. The child and her attendant should be impressed with the danger of carrying the infection to the eyes.

330. Vaginitis, elytritis, or **colpitis,** is an inflammation of the mucous membrane of the vagina. The mucous membrane of the vagina closely resembles the structure of the skin, having few, if any, submucous glands. It consists of connective tissue surmounted by papillæ covered with several layers of squamous epithelium. A longitudinal ridge is formed upon the anterior wall, from which rugæ, or folds, like the teeth of a comb, extend upon each side. This formation is less distinct upon the posterior wall. The central projections are known as the anterior and posterior columns. The former generally terminate below, in a rounded protuberance, called the vaginal tubercle, situated immediately above the meatus urinarius. Sometimes the anterior column is divided by a furrow into two portions. The rugæ aid in promoting sexual excitement, and probably contribute to vaginal enlargement during pregnancy and parturition. They disappear toward the upper part of the canal. The vagina receives its blood supply from the vaginal, uterine, internal pudic, and vesical arteries—branches of the anterior division of the internal iliac. The vagina is surrounded by a venous network or plexus, which communicates with those of the vulva, bladder, rectum, uterus, and broad ligament, and finally empties into the internal iliac veins.

The lymphatics of the lower fourth communicate with the superficial lymphatic glands; those of the upper three-fourths, with the internal iliac glands.

The nerves are derived from the sympathetic, and form

upon each side of the vagina a plexus which communicates with the inferior hypogastric.

The arrangement of the epithelium and the absence of glands render the vagina much less vulnerable to infection than either the uterus or vulva.

We have already referred to the normal secretions of the genital tract. Doderlein distinguished between the physiologic and pathologic secretions of the vagina. The former is markedly acid, dependent upon the presence of a bacillus which produces lactic acid. The latter may be feebly acid, neutral, or alkaline, and contain a variety of micro-organisms—saprophytic and pathogenic. Probably fifty per cent. of pregnant women have this pathologic secretion, in which germs flourish, and from which auto-infection is possible. The demonstration of the truth of this assertion greatly simplifies the study of the processes of infection.

The vaginal discharge becomes alkaline during the menstrual period, during the puerperium, and in many cases of leukorrhea—a condition which is more favorable for the growth of micro-organisms and the infection of the genital tract. Doderlein's assertion, however, does not correspond with the results of the researches of Menge, Krönig, and Walthard.

Krönig's investigations were confined to pregnant and puerperal women, and consequently are not a proper subject for consideration under gynecology further than to note his conclusion that the distinction between the physiologic and pathologic secretions is not determinable. He asserts that all secretions alike contain *no* pathogenic germs. All secretions are equally germicidal, though the vitality of the germ differs. It takes twice the time to kill the staphylococcus that it does to destroy the streptococcus. The vagina infected with germs will become aseptic in two or three days. The cause of this bactericidal power is as yet undetermined. It is not chemic, because it occurs whether the secretion is faintly or strongly acid; it is not believed to be due to a special bacillus, although some micro-organisms are known to be antagonistic to others. If it results from leukocytes, it must be due to a property independent of their contractile power, for the action continues after their subjection to a heat which would destroy the latter. The want of oxygen in the vagina will not explain it, for the staphylococci and streptococci are anaerobic—*i. e.*, grow independent of oxygen—and yet are killed. It is not mechanical, because particles of carbon and mercury are removed much more slowly. Possibly all these factors may unite to establish germicidal action. Krönig presents a very important practical observation, which is that a solution of

corrosive sublimate for irrigation destroys the germicidal action, probably by precipitation of albumin, while plain water but lessens it. A necessary inference is that prophylactic injections of corrosive sublimate are prejudicial when the secretion is normal. Menge, in his investigations upon the non-puerperal, introduced pyogenic micro-organisms into the vagina in eight women, and found that the vagina cleansed itself from these organisms in periods varying from two and one-half hours to three days. The factors which compass this germicidal action are various forms of bacteria and their products, an acid secretion, possibly serum action, and the absence of oxygen. This activity is weak in infants, and is lessened by menstruation and by increased secretion from either the cervix or the body of the uterus, or even from the vagina. It is decreased when the vulva is patulous or the uterus prolapsed, and at the menopause.

Walthard has directed attention to the influence of change of pabulum in restoring the lost virulence of micro-organisms. He inoculated the streptococcus into the ear of a rabbit without unfavorable results, unless the ear was ligatured to lessen tissue resistance, when a streptococcus from the vagina became as virulent as those found in puerperal fever. It is possible that an innocuous streptococcus may thus be restored by the tissues during the puerperium, and similarly in gynecologic operations in which there is bruising of all the tissues, as in the enucleation of fibroids.

331. Varieties.—Vaginitis may be divided into simple and specific (gonorrheal). The latter is exceedingly important because of its intractability and its tendency to extend. The distinction between acute and chronic is merely one of degree. Special varieties named are emphysematous, exfoliative, dysenteric, phlegmonous, diphtheric, and senile, but these are unnecessary distinctions.

The etiology and pathology have undergone some consideration in our discussion of the action of micro-organisms. Of these, the gonococcus is most important, for upon its discovery will frequently depend the diagnosis. It was discovered and described by Neisser. The recognition of its presence in the secretion is diagnostic, but its absence can not be considered a positive indication that the secretion is of other than gonorrheal origin.

332. Pathology.—In simple vaginitis slight elevations of the mucous membrane occur, producing a granular surface. The granulations are produced by groups of papillæ, which are infiltrated with small cells; as a consequence, the papillæ swell up and push before them the stratified squamous epithelium.

Superficial layers are shed. Later, the surface becomes more level, from thinning of the superficial covering. With the vaginitis of pregnancy not infrequently an emphysematous condition of the mucous membrane is associated. These elevations have been described as cysts containing a gaseous fluid. The gas consists of air and trimethylamin. Ruge says the gas is situated in the cellular tissue, while Zweifel says they are vaginal glands the ducts of which have become closed. A similar condition has been observed following the climacteric. The exfoliative, dysenteric, or diphtheric vaginitis presents localized patches or an inflammation of the whole vagina. In the latter condition the mucous membrane becomes so swollen that it is with difficulty the finger can reach the cervix, which is also thickened and covered with an exudation.

Senile Vaginitis.—After the menopause the epithelial tissue is desquamated, the papillæ atrophy, and the raw surfaces cause obliteration of a large portion of the vagina. It often causes curious constrictions of the upper vagina, rendering the canal frequently cone-shaped, with the small end above, which discloses the cervical opening as a mere dimple. Bands of contracting scar tissue are often seen, which divide the vagina into loculi. Desquamation of the epithelium occurs. This is probably produced by defective nutrition, and, later, granulations develop. A loss of elastic tissue also occurs, with an increase of connective tissue, which results in cicatricial contraction. The same process can cause occlusion of the cervical canal subsequent to the menopause.

Specific Vaginitis.—The most important cause of vaginal inflammation is gonorrheal infection. This produces an intractable form of vaginitis, which may continue for months, or even for years. It may extend over the mucous membrane of the uterus to the tubes, ovaries, and peritoneum, producing endometritis, salpingitis, pyosalpinx, ovaritis, and pelvic peritonitis.

333. Etiology.—Vaginitis is produced by gonorrheal infection; irritating discharges from the uterus; the contents of perivaginal abscesses; the contact of urine or feces from fistulæ; vaginal injections, too hot or too cold, or those containing injurious chemic agents; badly fitting pessaries; decomposing tampons; efforts to produce abortion or awkward attempts at sexual intercourse; and the exanthemata; and it may complicate typhus, smallpox, and scarlet fever. Diphtheric patches have been observed in a number of diseases, particularly in the puerperal state. Localized patches are seen in fistulæ, in carcinoma, and about badly fitting pessaries. The disease is induced by the habits of the patient. The free use of alcohol

produces the granular form of the disease. The gouty or rheumatic diathesis is a predisposing cause.

334. Symptoms.—Vaginitis is characterized by a sensation of burning, heat, and itching in the vagina; pain in the pelvic floor, increased by exercise; frequent desire to evacuate urine, with not infrequently scalding. A profuse mucopurulent leukorrhea soon occurs. These symptoms are present in both the simple and specific varieties. In the latter the disease begins as an acute infection within from twenty-four to forty-eight hours after exposure, with itching of the urethral orifice, increased desire to urinate, a sensation of heat about the vulva, and burning and scalding upon passing urine. Generally, the tenderness and discharge are moderate; occasionally, throbbing is substituted. The distress is increased by walking, even by moving the limbs, and by the slightest touch of the finger. The urethral orifice is reddened and slightly swollen, and a drop of thick mucus or mucopus can be pressed out. After one or two days the entire urethra is exquisitely tender, and the orifice is swollen, intensely red, and bathed abundantly with pus. Pus and blood can be extruded from the vagina by pressure over the urethra. The hymen, vestibule, and labia become swollen, edematous, and eroded, and are covered with pus and exudate. At the end of a week the acute symptoms have subsided, the discharge is abundant, and when the parts are neglected they become eczematous and cause a disagreeable odor. The vulva may regain its normal appearance in two weeks, while the discharge may continue for three or four weeks, or even longer. Infection of the vaginal follicles and of the vulvovaginal glands is not infrequent. The inguinal lymphatics become swollen, and may even suppurate. In the early part of the attack the gonococci are present to the exclusion of all other forms of bacteria, but later they may entirely disappear. The disease shows a marked tendency to invade the deeper and more important organs by the continuous mucous membrane.

335. Diagnosis.—Upon separation of the labia a profuse discharge is noticed, covering a reddened, thickened, and roughened or granular mucous membrane. The speculum reveals the vaginal mucous membrane as a red, swollen, smooth, velvety surface, from which the rugæ have disappeared; or the redness, as well as the discharge, may be present only in patches. The cervix should be inspected, as the infection generally begins in it. The differential diagnosis between simple and specific vaginitis is often difficult. The history of a distinct infection would be valuable, but it is often too delicate a subject for interrogation. It may be suspected from the sudden onset

of the attack, associated with urinary symptoms, a protracted course, and obstinate resistance to treatment. The inflamed urethra and ducts of the vestibule and the orifice of Bartholin's ducts, and not infrequently the formation of cysts or abscesses in the ducts or glands, with swelling of inguinal glands, afford additional confirmation. The recognition of the gonococcus by culture and microscopic investigation renders diagnosis certain. The absence of the gonococcus is not proof positive of nongonorrheal origin, for the gonococcus may disappear from the secretion.

Even when the specific origin can be determined beyond peradventure, caution should be exercised in the expression of an opinion, as it may cause serious social unhappiness. The diagnosis of simple vaginitis will not be sufficient, but the physician should carefully interrogate the various structures to determine, if possible, the exact cause. Pelvic abscesses, discharging into the vagina, have been mistaken for vaginitis.

336. Prognosis.—The ease and rapidity with which vaginitis can be cured will depend upon the cause. The milder cases can be confined to the external genitalia, or may disappear even after the Fallopian tubes have become affected. In the more severe forms the entire genital tract may be rapidly involved, and portions of the tract may retain the disease and reinfect other portions. The general health is impaired in the chronic cases. The ovum, when it can enter, may find the uterus unfitted for its retention and, therefore, an abortion may result. Preexisting gonorrhea is said not to disturb the first two weeks of the puerperium, but subsequently there is a marked tendency for the germs to develop renewed virulence and to invade the healthy structure.

337. Treatment.—When the disease is in its acute stage, the patient should be kept absolutely quiet in bed. Sexual activity should be suspended, as well for the interests of the patient as for the prevention of further propagation of the disease. The diet should be confined to non-stimulating articles. Alcoholic stimulants, peppers, and various other condiments should be prohibited. Saline laxatives are advisable, and the patient should be encouraged to drink largely of emollient liquids or alkaline waters.

Local applications should consist of hot sitz baths, alkaline douches, and of a saturated solution of boric acid in hot water, given for fifteen to twenty minutes out of every two or three hours during the day, and every four while the patient is recumbent at night. The ordinary fountain syringe serves well, or a piece of rubber tubing weighted at one end and provided with a clip and nozle at the other. The weighted end, with

the coiled tube, is placed in a basin of water above the level of the bed, the clamp applied, and the end of the tube withdrawn and introduced into the vagina. The clip opened, the water is siphoned out as long as the external end is kept below the level of the basin. When the acute symptoms have subsided, douches should be given every three hours for the first two weeks. These douches may consist of solutions of sublimate 1 : 4000, potassium permanganate 1 : 4000, carbolic acid, lysol, or creolin, protargol 0.5 to 1 per cent., mercurol 2 per cent. After the period mentioned the strength of the fluid can be doubled and the frequency of the applications is lessened, now employing them four times daily. The dry treatment consists in cleansing the surface with a douche or by washing the vagina through a speculum; after which, dry and pack with borated or iodoform cotton, and repeat every eight hours until the secretion is checked, when it is given twice daily. A dry absorbent dressing must be applied to the vagina every two hours.

Astringent douches are substituted in chronic cases and after the subsidence of the acute stage. Cleanse and dry the vaginal walls and paint with silver nitrate solution (ʒj : fʒj), followed by a tampon saturated with a solution of bismuth in glycerin, which keeps the walls separated. Fritsch recommends zinc chlorid (gr. ij : fʒj). A one per cent. solution of lead acetate, zinc sulphate, or alum sulphate, potassium permanganate (1 : 2000), or painting the surface with undiluted tincture of iodin are serviceable. Acceptable powders are equal parts of tannin and iodoform, and bismuth subnitrate and chalk, retained with a tampon. In senile vaginitis cleanse with a saturated boric acid solution. Tampons may be saturated with a 0.5 per cent. solution of lead acetate, or strips of lint may be saturated in a five per cent. solution of carbolic acid in glycerin or smeared with zinc ointment. Vaginal suppositories of tannin and iodoform, each five per cent.; zinc oxid, ten per cent.; or lead acetate, two per cent., may be employed. When the condition is very chronic, spray through a speculum with a two per cent. solution of silver nitrate. The spray drives the medicine into the crypts and folds, and is far more effective than swabbing. I have derived more benefit from tampons anointed with ichthyol in lanolin (1 : 4). It causes a desquamation of the entire epithelium of the vagina and is destructive to the gonococcus.

338. Urethritis.—Inflammation of the urethra is an exceedingly painful, but not an unusual, complication of pelvic abdominal procedures in which the catheter has been employed.

Varieties.—It may be manifest as a simple hyperemia, an

acute catarrhal urethritis, a chronic interstitial urethritis, or a granular or follicular urethritis. Associated with the urethral inflammation occasionally occur ulceration, fissures, and a sacculated condition of the urethra.

339. Hyperemia may result from injury during a difficult labor; from uterine displacement and uterine growths affecting the pelvic circulation; from varicose veins, irregular urination, excessive coitus, or long-continued irritation. Probably the most frequent cause of hyperemia which may continue until inflammation results is the repeated use of the catheter. So probable is such a result that the majority of operators prefer, if possible, to have the patient evacuate the urine unaided. When the employment of the catheter is necessary, the operator should have the nurse introduce the instrument for the first time in his presence, so that he can observe what precautions she employs and determine the ease with which she can accomplish the procedure. The instrument should never be introduced by touch, but always by sight. The vulva and the vestibule are generally covered with discharge, which may have decomposed and become infected by micro-organisms capable of producing serious discomfort when carried into the bladder.

The labia minora should be separated and the vestibule sponged with absorbent cotton saturated with an antiseptic solution. The instrument, preferably of glass, should be perfectly smooth, with no rough or cutting edges. It should be boiled, kept in an antiseptic solution, and previous to its use washed with sterile water. It is then anointed with carbolized vaselin and carried by gentle pressure upward and backward, without exercising any force. If the passage of the catheter is obstructed, withdraw and reintroduce it, as the instrument may have entered one of Skene's follicles.

Even with the exercise of every precaution the urethra is often so irritated by the frequent introduction of the catheter that the patient may suffer more distress than from the condition for which the operation was performed; consequently whenever the patient can evacuate the bladder unaided, she should be encouraged to continue to do so, as the contact of healthy urine with a plastic wound, if the precaution is observed immediately to irrigate the latter, is less harmful than would be frequent catheterization.

In operations upon the bladder which require the urine to be frequently evacuated, a self-retaining catheter should be left in place several days. A soft-rubber instrument with a flange upon its vesical end is most serviceable. It can be plugged, permitting the urine to collect for two or three hours. It should not be permitted to remain longer than forty-eight

hours without removal and careful cleansing. The ordinary glass catheter, with a long rubber tube attached, in my experience, does equally well.

340. Acute Catarrhal Urethritis.—The mucous membrane becomes thickened; its papillæ are hypertrophied and are covered with an imperfectly developed epithelium. At points the latter is desquamated and the papillæ are enlarged. This may result in the formation of a considerable sized mass, which projects from the surface frequently by a pedicle—the urethral caruncle.

The acute disease can arise from long-continued and repeated hyperemia or from traumatism, but it most frequently results from gonorrheal infection. The urethra is often the first point affected.

Symptoms.—The onset of the acute attack is at first made known by itching or smarting of the urethral orifice, as the contact of the urine gives a sensation of a hot scalding liquid and urination is followed by intense burning along the course of the urethra. The meatus becomes red and swollen, then dark red and pouting. It is tender to the touch, and pressure along the urethra causes a few drops of mucopurulent or purulent secretion to be discharged. If the disease does not extend to the bladder, the symptoms soon subside or disappear.

Diagnosis.—The condition should not be confounded with cystitis. The tenesmus of urethritis can be controlled; it is attended with scalding, but is relieved by urination. In cystitis the tenesmus is uncontrollable, unrelieved by urination, and there is no urethral burning.

341. Chronic catarrhal urethritis is very generally an interstitial inflammation. The membrane is thickened and the canal narrowed, not infrequently permanently so, which results in a stricture.

Symptoms.—Urination is frequent. Temporary retention of urine may, however, be caused by a spasmodic stricture. The latter is greatly aggravated by frequent coition or prolonged exercise. The thickening of the urethra is apparent upon passing the finger down the anterior wall of the vagina along its course. A small sound can be passed through the urethra, while the introduction of a large one meets with resistance and produces severe pain.

342. Follicular inflammation involves the follicles about the orifice of the urethra and Skene's glands. The latter are two tubules which will admit a No. 1 probe (French scale), and are situated in the floor of the female urethra, extending upward from the meatus about one or two centimeters. In the normal condition the orifices of the tubules are three milli-

meters within the meatus, but with the urethra slightly prolapsed and the meatus everted, the orifices may be exposed to view. The upper ends of these canals terminate in a number of divisions, which project into the muscular wall of the urethra. These tubules occasionally become so enlarged as to permit the introduction of a small catheter. If such an instrument were forcibly introduced, it would tear through the tubule and establish a false passage. Such a passage might enter the urethra or pass beneath it into the tissue and thus enter the bladder. The follicles and tubules about the urethral orifice may become inflamed, with the consequent discharge of mucus and pus. The mucous membrane may become thickened or the orifices closed. The latter will result in the formation of small cysts.

Symptoms.—The symptoms are great tenderness; discomfort in sitting, standing, or walking; dyspareunia; stinging pain; a sensation of heat; and frequent and painful micturition. The orifice of the meatus is partly everted, with red, puffy folds, which simulate caruncle, and with erosion of the labia minora and of the edge of the meatus. A few drops of purulent discharge can be extruded by pressure along the urethra.

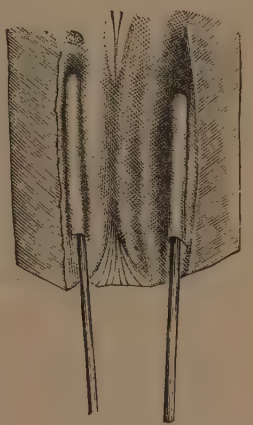


Fig. 277.—Urethra Laid Open with Probes, Distending Skene's Glands. Posterior Wall Divided.—(*Byford, after Skene.*)

343. Ulceration is produced as a result of traumatism, from calculi, unskilful use of the catheter, specific infection, or the presence of the diphtheric or the venereal poison.

During the passage of a calculus, or while in labor, injury, laceration, or overdistention of the middle portion of the canal occurs, with contraction of the meatus. A small portion of urine and mucus is retained, which decomposes, and results in the development of inflammation and in the production of a condition simulating an abscess.

Symptoms.—The most prominent symptom is dysuria, which becomes chronic. The meatus is large, of a deep red color, granular appearance, and sensitive to pressure. The passage of an ordinary sound is readily accomplished, but is attended with pain. Sometimes a drop of blood is discharged. The sacculated form is associated with a large discharge of pus, particularly when pressure is made along the urethra. Even when the discharge of urine is perfectly clear, pressure will cause a considerable discharge of pus.

344. Vesico-urethral fissure holds an intermediary position between cystitis and urethritis, and strikingly resembles both. Its cause is undetermined. The fissure is situated at the internal meatus, and resembles a crack in the lip or an ulcer similar to that which is found in fissure of the anus. The fissure is usually considered as being situated in the neck, but, as a rule, two-thirds of it is in the urethra. Only the upper end of it extends into the bladder. It may occur at part of the circumference of the urethra, but, according to Skene, it is, in the majority of cases, situated upon the right side. In length it is from six millimeters to one centimeter, and is from two millimeters to four millimeters in width at the widest part. It is deeper at either end. The deepest portion, yellowish-gray in color, resembles an indolent ulcer, while its edges are red and inflamed. Through an endoscope it looks like a fresh tear, the edges of which are abrupt, elevated, and indurated. Its situation explains the attendant discomfort. In any other portion of the urethra it produces little inconvenience beyond a smarting sensation, but at the junction of the bladder and urethra it is subject to constant though slight pressure, which causes severe and continuous pain. The portion of the fissure extending into the bladder is exposed to irritation from contact with the urine, producing a constant desire to urinate, a sensation of burning at the neck of the bladder, acute pain during and immediately following micturition, and severe tenesmus, causing the patient to continue straining efforts after emptying the bladder. The pain and burning immediately following micturition are often intense. Subsequently, it partly subsides, to return with the accumulation of a small quantity of urine. If the patient resists the inclination to urinate, the distress is greatly aggravated.

345. Diagnosis of Urethral Inflammations.—The recognition of inflammation of the urethra is often difficult, because it is frequently complicated by inflammation of the bladder. Acute catarrhal inflammation of nonspecific origin usually begins gradually, and is often preceded by uterine or vesical symptoms, while the gonorrheal variety appears abruptly, and is preceded or attended by acute vaginitis or vulvitis.

In both varieties urination is painful. Sharp scalding is produced by urine passing over the inflamed surface, but the desire to urinate is not so frequent or urgent as in cystitis. Often the urine is long retained, for fear of the pain occasioned by its evacuation.

Slight hemorrhage is occasionally noticed, the urethral origin of which is evident from it being unmixed with urine, a few drops oozing from the external meatus subsequent to urina-

tion. Urethral discharge is common, and, except just after urination, it can be extruded from the orifice by pressing upon the urethra from the vagina. Microscopic examination of the discharge may reveal the presence of gonococci, which determines the nature of the urethritis. Absence of this germ, however, is not positive proof against the gonorrheal origin. To exclude cystitis, introduce the catheter, allow some urine to escape to wash away the mucus introduced with the instrument, and retain the remainder, which will be found free from sediment. Pressure along the urethra from the vagina is painful in urethritis, while pressure over the bladder, unless complicated by cystitis, is not uncomfortable.

In chronic urethritis the urethra is less sensitive, but it will be noticed as a somewhat thickened cord when examined from the vagina.

In *granular erosion* the pain during micturition is excruciating, it is associated and followed by tenesmus, and is more likely to be found in old persons.

The character of the disease is assured by its history and by the appearance of the urethra. Fissure, urethritis, and cystitis are distinguished, the latter especially by examination of the urine. Fissure alone is free from all the products of cystitis. Urethritis is excluded and the fissure detected by the use of the endoscope. The endoscope is more satisfactory than the ordinary open instrument because it exposes the surface of the fissure, which would be overlooked with the open end instrument. As a rule, the pain in fissure is more circumscribed than in either urethritis or cystitis, and in many cases more acute.

The maximum of pain in fissure follows urination, while in cystitis there is a sense of relief. In urethritis the most severe pain occurs during the act of urination. It then subsides slowly.

346. Treatment of Urethral Inflammations.—In urethral hyperemia render the urine bland and unirritating by the exclusion of acids and stimulants from the diet and by the administration of saline cathartics. Relief is enhanced by giving ten grains of benzoate of ammonia or benzoate of sodium every three or four hours, and by the employment of hot hip-baths and hot vaginal douches.

Acute urethritis, whether specific or otherwise, should be treated upon the same principles as in gonorrhea of the male. The treatment consists of constitutional and local measures. Internally, salicylic acid in ten-grain doses lessens the discharge. Douche the urethra frequently with hot water through a reflex catheter, so that the current flows back from a cap on

the end of the instrument. Later, inject from one-half of one to one per cent. of carbolized water; sublimate, gr. $\frac{1}{40}$, to aq., f℥j; silver nitrate, gr. $\frac{1}{8}$, to aq., f℥j; or zinc chlorid, gr. x, to aq., f℥j; preceded, when injection is painful, by the instillation of a solution of cocain with a pipet.

In making urethral applications it should not be forgotten that the canal will hold but from ten to fifteen drops. If a larger quantity is thrown in by the pipet, it flows into the bladder. A strong solution of silver nitrate (gr. x–xv to aq. f℥j) may be applied by pipet or applicator.

Internally may be administered those remedies which will have an inhibitory influence through the urine. These so-called blennorrhagic remedies are: copaiba, cubebs, sandal-wood oil, urotropin, and aminoform.

The itching of subacute and chronic urethritis may be alleviated by applications of different combinations of chloral or hydrocyanic acid, as in the following prescriptions:

℞. Chloral, ... ℈iv
Lanolin, ... ℥j. M.
Ft. ungt.

℞. Chloral,
Camphor, ... āā gr. xxx
Lanolin, ... ℥j. M.
Ft. ungt.

℞. Acid. hydrocyan. dil., ... ℥j
Plumbi acet., ... gr. xv
Glycerin, ... f℥j. M.

These remedies may be brought in contact with the affected surface by the applicator. A suppository or bacillus of cocain in cacao-butter, or in combination with lead acetate, will give relief. These bacilli should be introduced into the urethra two or three times in the twenty-four hours, preferably after urinating. In prolonged chronic disease which has resulted in thickened walls and a more or less contracted canal, the dilatation of the urethra by bougies once or twice weekly will be beneficial.

The bougie may be anointed for introduction with mercuric oleate, the official ointment of mercury, or any other medicinal agent which will have a beneficial influence upon the mucous surface. M. Julien, of Paris, applies ichthyol by dipping into it a cotton-wrapped probe, which is passed and repassed into the urethra several times. This agent has a destructive influence upon the gonococcus.

Granular erosion is best treated by brushing pure carbolic acid or silver nitrate (gr. xv to aq., f℥j) over the surface. This should be repeated in eight or ten days. The urethra should

be previously dilated. Following the subsidence of the acute symptoms, a few drops of a solution of zinc sulphate, gr. iv, fluid extract of hydrastis canadensis, f℥j, aq., f℥iij, may be used twice weekly with a pipet. Mercurol, 2 per cent. solution, has been found very serviceable.

In fissure, instillations and injections do harm, by increasing the spasmodic contraction of the bladder, and they add greatly to the discomfort of the patient.

A fissure may be exposed by a fenestrated speculum, and dusted with calomel, finely pulverized iodoform, or bismuth subnitrate, or the mitigated stick of silver nitrate may be employed. Incision of the fissure as performed in anal fissure is successful. The urethra should have been previously dilated. Dilatation is one of the most effective methods of treating fissure. The precaution must be exercised, however, not to overdilate the urethra and thus produce permanent incontinence.

Follicular urethritis is most effectively treated by splitting up the tubes their entire length. This may be done with the

Fig. 278.—Reflex Catheter.

thermocautery, or they may be cauterized with carbolic acid and subsequently treated with milder agents, as in urethritis. In such cases, however, splitting up the canal is a prerequisite to cure.

347. Cystitis is an inflammation of the mucous membrane of the bladder, and may be either *acute* or *chronic*.

Etiology.—The bladder is in intimate muscular relation with the uterus, as well as dependent upon the same nerve-centers and ganglia for its nervous distribution. A portion of the bladder lies in direct contact with the cervix, but in more close relation with the vagina. It is not surprising, then, with such intimate relations, that the condition of the bladder should be affected by disorders of the uterus.

Inflammatory conditions of the bladder, if they have not originated from disorders of the uterus, are aggravated thereby. The symptoms of cystitis are more marked during menstruation and greatly aggravated by metritis. Vesical symptoms are engendered by uterine and vaginal displacements, by subinvolution and hypertrophy, by tumors and pregnancy. The

train of phenomena thus engendered may be enumerated as: difficulty in evacuation; retention and decomposition of the urine, producing irritation, and finally cystitis. Cystitis may be secondary to inflammation of the kidneys, ureters, or urethra. Chemic modifications of the urine may result from indiscretions in diet, from the administration of irritating drugs, or from affections of the central nervous system. Inflammation is produced by traumatisms, injuries from the introduction of a catheter, or the presence within the bladder of a rough calculus.

Without doubt, the most frequent cause of cystitis is infection. This may result from the deposition of bacteria by the blood, from the extension of inflammation from neighboring organs, or the introduction of infection by way of the urethra. The infection is generally introduced into the bladder from the employment of the catheter. A violent form of cystitis is produced by retention of urine. A pregnant retroflexed uterus which has become impacted in the pelvis by pressure upon the neck of the bladder not infrequently leads to gangrene and desquamation, or to separation *en masse* of the entire vesical mucous membrane. Neoplasms, such as cancer, tuberculosis, polypi, and villous tumors, will usually excite a cystitis.

Pathologic Changes.—The mucous membrane becomes injected, particularly about the orifices of the ureters and internal meatus. As the inflammation progresses, the entire mucous membrane is swollen and becomes a bright red. The epithelium is desquamated and patches of ulceration or hypertrophied papillæ appear, which bleed easily. Abscesses develop in the vesical wall. The micro-organism most frequently found is the bacillus coli communis. Disease is also induced by the staphylococcus, the gonococcus, and the bacillus tuberculosis.

348. Symptoms of Acute Cystitis.—Acute inflammation of the bladder is characterized by painful micturition; frequent desire to void urine, with only a few drops discharged at each attempt; severe vesical, and frequently rectal, tenesmus; a sensation of fullness or weight in the hypogastrium; shooting pains in the perineum and anus; and a burning, lancinating pain, like a hot iron, in the urethra. These attacks may be almost continuous, or may, after a time, subside, to recur again in an hour or so. Examination by touch, whether over the abdomen or by the vagina or rectum, is extremely painful. The urine is scanty, highly colored, and becomes cloudy after standing. In very severe attacks the urine becomes a dark red color and contains blood and pus-corpuscles and uric acid crystals.

Constitutional disturbances are marked. These are nervous

excitement, insomnia, and anorexia, followed by emaciation and loss of strength. Uncomplicated vesical inflammation does not cause elevation of temperature (Guyon). Partial or complete retention of urine is frequent. Paroxysmal pain results from vesical distention, and there may be frequent evacuation or continuous dribbling of urine without at any time emptying the bladder—an evidence of overflow known as the incontinence of retention. The course and duration of the disease are variable; it may subside in a few days or may continue alternately better and worse for weeks.

349. Symptoms of Chronic Cystitis.—In chronic inflammation the symptoms are less pronounced, though similar to those of the acute disease. Micturition is frequent and painful, often difficult. The pain is pronounced at the beginning of the evacuation, thus leading to delay in starting. Exposure to cold, dampness, changes of clothing, indiscretions in diet, or constipation, lead to acute or subacute attacks. The urine, after standing, becomes cloudy, and contains blood and pus-corpuscles, mucus, and uric acid crystals. If drawn with the catheter, it is at first clear, then turbid, and toward the last pus is apparently discharged. The microscope reveals leukocytes, epithelial cells, tissue debris, and salt crystals. When the urine stands, it becomes alkaline, and bacteria in abundance are found.

Constitutional Condition.—The patient is easily fatigued, has no appetite, loses flesh, develops a cachexia, has repeated inflammatory attacks associated with fever, repeated chills, a more or less continuous diarrhea, profuse sweating, and, finally, a fatal termination results. Such a train of symptoms and such a termination indicate the presence of an infectious pyelonephritis as a complication.

350. Cystitis of gonorrheal origin is produced by the extension of gonorrheal infection from the urethra, possibly through the careless employment of the catheter, but more frequently from the continuation of urethritis to the bladder. Its principal symptoms are frequent micturition, agonizing pain in the acute stages, associated with changes in the quality of the urine; hematuria is a constant symptom, but is rarely profuse. These symptoms do not occur in the early stage of the infection. The disease is then generally much milder, characterized only by tenesmus. In the mucopus of the urine, from the associated urethritis, the gonococcus may be found.

351. Tubercular cystitis causes symptoms very similar to those produced by inflammation from gonorrhea and the irritation of calculi. Hematuria is a symptom in all varieties, but differs in tuberculosis. It appears early in the disease,

and the blood is generally mixed with the last drops of urine. The bleeding ceases as the disease advances. In common with other vesical inflammations, pain, urethral spasm, and retention and incontinence of urine are marked.

352. **Diagnosis of Cystitis.**—Cystitis is not difficult to recognize. The frequent micturition, pain, alkaline reaction of the urine, large quantity of sediment, and muco-purulent appearance are ample evidence. In cystalgia and functional diseases of the bladder the urine will be found clear. Probably the greatest difficulty will be experienced in differentiating pyelonephrosis. Indeed, the infection from the kidney may lead to disease of the bladder and *vice versa*. The prognosis and method of treatment must depend upon the accurate determination of the structures involved.

The existence of pyelonephrosis is recognized by finding the urine unaltered after irrigation of the bladder, while in cystitis it becomes clear. The condition of the urine from each kidney is recognized by securing the urine separately through catheterization of the ureters or by the employment of the Harris segregator.

The careful investigation of the urine will often be sufficient to determine the diagnosis. Albumin is contained in the urine in either cystitis or pyelitis, but in very slight amount in the former, while it is present in quite large proportions in the latter.

The presence of a proportionately great abundance of albumin in the urine, associated with pus, should be considered as indicating the presence of renal disease. The most frequent cause is tuberculosis. The diagnosis of tuberculosis of the urinary tract is determined by the presence of the tubercle bacillus in the urine. Dr. Joseph Walsh, of Philadelphia, associated with Dr. Flick, in his investigations in tuberculosis, however, informs me that the tubercle bacillus is found much more frequently in the urine of the tuberculosis patients than is generally supposed. The great majority of these patients will be found not to have a tuberculous kidney, though they will show a catarrhal condition of the kidneys, which is manifested by pains or aching in the bones, and by the presence in the urine of epithelial or granular casts, pus, and sometimes albumin. The bacilli may be found in the urine without any inflammatory symptoms. In sixty non-selected tuberculous patients, whose urine Dr. Walsh examined, the bacilli were recognized in forty-four; in thirty of these the disease was in an advanced stage; in ten it was considered marked, and in four, was only incipient. In patients in the advanced stages of the disease it is rarely that the bacilli will not be found in the urine. In five of the forty-four cases above cited, tubercle

bacilli were found in the urine, but not in the sputum, though the presence of a pulmonary lesion was recognizable. I have quoted Dr. Walsh fully, because his investigations seem to demonstrate that the presence of tubercle bacilli in the urine can not be accepted as evidence of the existence of a true renal lesion. The usually recognized difficulty of finding the bacilli in the urine is my justification for quoting here Dr. Walsh's method of examination: "Six fluidounces of urine are centrifugated in a water motor centrifuge; the sediment is then poured on one or two cover-glasses and allowed to dry thoroughly (twenty-four to forty-eight hours). The process is complicated by an excess of the crystalline sediment, which may render it impossible to find the micro-organism. In such cases, therefore, the sediment secured by centrifugation should be dissolved in water, a weak nitric acid, or a caustic potash solution, and again subjected to the centrifuge. In rare cases the sediment may resist any one or all of these solutions. After drying, it is fixed to the cover-glass by passing the latter through a flame two or three times, repeating this procedure twice, at intervals of a minute or two. The procedure for determination of the bacillus in urine requires more heat than the corresponding examination of the sputum. Even after the procedure for fixing given, the sediment will occasionally be washed off by the running water, and the specimen thus destroyed.

"The specimen is stained with carbol-fuchsin for three to five minutes or longer, washed in turn with 95 per cent. and absolute alcohol for one to three minutes, decolorized and counterstained with Gabbet's solution. The greater number of foreign elements in the urine, some of which hold the fuchsin, makes a larger experience necessary for the recognition of the bacilli than is requisite in sputum.

"The organisms must be absolutely typical to render the diagnosis certain."

In examining over the abdomen of a patient suffering from tuberculous cystitis, greater pain is experienced by suddenly withdrawing the hand pressure than is produced by deep palpation. A cystoscopic exploration of the bladder will reveal the extent of involvement and amount of tissue destruction. Tuberculous cystitis may supervene upon the gonorrheal, without cessation of the latter.

Primary vesical tuberculosis is manifested by a very irritable bladder, frequent and painful micturition followed by the passage of a few drops of blood. Such symptoms may subside, to be followed by an aggravated attack. The presence of pus in the urine indicates pre-existing disease, which may have been unsuspected. The progress of the disease is

more rapid when complicated by the discharge of pus, the presence of a fistula, or the existence of pyelonephritis. The latter complication should be suspected when the urine shows the presence of a large pus sediment, inordinate quantities of albumin, and if the patient gives a history of incontinence of urine and repeated exacerbations of high temperature. Polyuria is a most constant symptom of urinary tuberculosis.

Gonorrheal cystitis is associated with evidences of infection of other portions of the genito-urinary tract, particularly the urethra, glands of Bartholin, cervix and pelvic organs, which have preceded the vesical disease. The gonococcus can generally be found.

A form of inflammation of the bladder, known as membranous cystitis, is a condition in which there is more or less extensive exfoliation of the bladder-wall, as in pseudo-membranous, gangrenous, croupous, or diphtheric inflammation. It is always secondary to overdistention of the bladder from retention of urine. The mucous membrane is anemic during distention, but, upon the removal of the bladder contents, it becomes acutely congested and engorged with blood. It may be produced by any obstruction of the urethra. The most frequent causes are incarceration of a retroflexed gravid uterus, unilateral hematometra, fibroid and ovarian tumors deeply seated in the pelvis, and loss of muscle power in low fevers and in septic conditions.

The nurse or attendant may be led by the incontinence to overlook the occasionally enormous distention. The enlargement is gradual, extending above the navel, in the form of a tumor, which may very readily be mistaken for an ovarian cyst. The distention reaches its maximum when the reservoir can retain no more, and the abdominal pressure produces an involuntary discharge of the overflow, a condition which has been spoken of as incontinence of retention.

Even though the bedding is constantly soaked with urine, the bladder is never completely emptied. The continuous pain, involuntary discharge of urine, a suddenly formed, gradually increasing tumor, percussion; dulness over its site, absence of the uterus above the symphysis, and the projection backward of the anterior vaginal wall, should make plain the diagnosis. Constant dribbling of urine should always awaken suspicion of such a condition.

Catheterization of such a patient by an ignorant midwife may cause the formation of a false passage, or negligence in the previous cleansing of the vulva will favor the entrance of infective agents into the bladder. No more favorable conditions for the extension of the sepsis could be imagined.

Even if cystitis did not exist, hyperemia, infection, and traumatism, as a result of retention, would not be surprising. The enormous distention of the bladder causes anemia of its mucous membrane, thus producing disturbance of nutrition and superficial necrosis. Deep necrosis is caused by bacterial action. All such processes favor destruction of the mucous membrane. The inner wall of the bladder may become partially or completely detached, covered with phosphates of ammonium and magnesium, and penetrated with putrescent bacteria. The surface of the membrane is black or gray, contains numerous excavations and sometimes horny concretions. The mucous membrane may come away in pieces or as a complete cast of the bladder.

A portion of the membrane or the entire structure may lodge in front of the urethral orifice and completely obstruct the evacuation of urine. A small quantity of pus only may reward the introduction of the catheter. This pus has accumulated at the lower portion of the bladder, but a more forcible pressure of the catheter may cause it to penetrate the membrane and permit the evacuation of the decomposing urine. Violent tenesmus is a frequent symptom of such conditions. The urethra, dilated, will often permit the expulsion of the entire sac as a black, putrid mass. Cases have been reported in which complete exfoliation has taken place and the patient subsequently recovered good health without disturbance of the vesical functions. Neoplasms are differentiated from cystitis by the early appearance of hematuria with absence of pain, tenesmus, or frequent micturition.

The quantity of blood increases near the close of micturition; it may continue for days or weeks, and may suddenly cease. Sometimes fragments of the growth may be discharged. Hematuria dependent upon tumors varies with their character. If the growth is benign, its progress is slow, unless the pelvis of the kidney and ureters are involved.

Cystitis due to the presence of foreign bodies, such as calculi, is characterized by severe pain, frequent micturition, violent expulsive efforts, and hematuria, after active exercise. In arriving at a correct diagnosis, it must not be overlooked that very marked disturbance of the bladder may arise from the administration of various drugs, from the application of vesicants, especially cantharides. In such cases micturition is frequent and very painful, while tenesmus is marked. The withdrawal of the irritating cause is followed by prompt relief.

353. The prognosis of cystitis is necessarily uncertain, and must depend upon the duration and character of the disease, extent of involvement, complications, and carefulness of treat-

ment. When the disease has existed for a long time, the inflammation has extended through the mucous surface, more or less involving the muscular coat and causing contraction and distortion of the organ. It can readily be understood, therefore, that no treatment will restore the functionating power of the organ.

The prognosis is especially unfavorable when the disease has extended to the ureter, and especially to the pelvis of the kidney. Tubercular disease of the bladder also determines an unfavorable prospect for ultimate recovery, although I have seen most gratifying results when the tuberculosis was secondary to disease in one kidney and ureter after the removal of the offending organs. The favorable results in all cases will largely depend upon the carefulness of the treatment and the degree of coöperation the physician can secure from his patient.

354. Treatment.—In the treatment of inflammation of the bladder, the aim should be, first, to remove or lessen its cause; second, to afford relief to pain; third, to improve the general condition of the patient.

Prophylaxis.—The first indication is met most completely by prophylaxis, which, in all conditions dependent upon microbic invasion, should be the first consideration. Disinfection of the body, of the surroundings, of the hands, and of the instruments is necessary. The old procedure of introducing the catheter by touch is reprehensible. In the puerperal woman artificial light may be necessary. The legs should be flexed strongly, the better to bring the vulva into view. A small vessel is placed between the limbs, or the patient may be placed upon a bed-pan and a warm disinfectant fluid poured over the vulva, which may enable her to void the urine spontaneously. If unsuccessful, the vulva is sponged with a cotton tampon and an irrigation stream is directed upon the urethral orifice. Then the catheter is taken from a disinfecting fluid and carefully introduced, to avoid pain. Occasionally, there is resistance at the internal end of the urethra, which is not overcome without pain. Care should be exercised in the withdrawal of the instrument, as the mucous membrane may be sucked into the eyelet of the catheter. Pushing up the instrument before its withdrawal will loosen it, when it can be removed without vesical injury. Whenever possible, the use of the catheter should be avoided, as, notwithstanding all precautions, the mucous membrane of the urethra will be irritated by its frequent introduction, thus affording an opportunity for infection.

Medical treatment to a limited degree meets all the indications

we have assigned for the treatment of cystitis. The acidity and tendency of the urine toward decomposition are combated by the use of diuretics, and by the administration of large quantities of the alkaline waters, such as Saratoga, Vichy, Seawright, Buffalo or Londonderry lithia, Carlsbad, or Seltzer. The salicylates are among the most efficacious remedies. Salol 2 to 3 grains can be given every three or four hours. Strontium salicylate 3 to 4 grains four times daily. Some of the formalin compounds have been found very effective, as urotropin, grains 5 to 10, four times daily. Probably aminoform, 5 to 10 grains four times daily, will give greater satisfaction. These drugs should be administered largely diluted. They prevent decomposition, remove the odor, and decrease the pain and tenesmus. They should not be given on an empty stomach. The diet, though nutritious, should exclude stimulants, acids, and condiments, except salt. Sugars and starches should be sparingly used, and in acute and severe cases it is well to restrict the patient to skimmed milk. In acute cases the patient should be confined to bed, and all exposure to dampness or cold should be avoided. In all cases care should be exercised regarding suitable clothing and protection against exposure. Pain may be so marked and micturition so frequent that measures must be instituted for its relief. Morphin or opium affords relief, but the pain soon returns. The remedy can not be repeated every two or three hours without danger of establishing the habit. An ice-bag over the bladder will frequently give comfort; in other cases the hot-water bag is better borne.

In the more distressing cases opium may be given in combination with belladonna or stramonium; deodorized tincture of opium and tincture of belladonna, 10 to 15 drops of each every two or three hours until relief; or suppositories of extract of opium, $\frac{1}{4}$–$\frac{1}{2}$ of a grain, and extract of belladonna, $\frac{1}{8}$–$\frac{1}{4}$ of a grain, in cacao-butter—two, three, or four of these suppositories daily, according to the degree of pain. Relief is most quickly secured, however, by a hypodermic injection of $\frac{1}{6}$ of a grain of morphin. When opium is badly borne, cocain hydrochlorate, $\frac{1}{6}$ of a grain, may be given by suppositories in combination with the same quantity of extract of hyoscyamus. When the pain is limited to the urethra, it may be subdued by injecting a solution of cocain by a syringe with a bulb nozle. The openings about the bulb should be so situated as to direct the current back toward the external orifice. A celluloid is preferable to a metal syringe, because it can be used for sublimate and silver nitrate solutions.

Inflammation of the neck of the bladder may be alleviated by the introduction night and morning of a vaginal tampon

covered with an ointment containing 30 grains of extract of belladonna to 1 ounce of camphorated lanolin.

Calculi and foreign bodies should be removed and shreds of membrane and casts of the bladder should be early separated and evacuated.

Gonorrheal and acute cystitis are considered as requiring diuretics, such as the alkaline salts, alone or in combination with oil of birch, buchu, or triticum repens. The following prescription is often serviceable:

℞. Ammon. benzoat., ... ℥iij
Tr. hyoscyami, ... f ℥ j–ij
Ext. buchu *vel* tritici repens, ... ad f ℥ ij. M.
Sig.—A teaspoonful in an ounce of water four times daily.

Marsh directs:

℞. Acid. oxalic., ... gr. xvj
Syr. aurant. cort., ... f ℥ j
Aq. pluv., ... ad f ℥ iv. M.
Sig.—A teaspoonful every four hours.

The bromid salts are often of value.

Free evacuation of the bowels by salines should be secured. After the severe distress and pain have subsided in acute cases and in all chronic inflammations, advantage may be secured by intravesical medication.

The bladder is irrigated through a return-current catheter by means of a fountain syringe: the fluid may be permitted to flow in until the discomfort is marked, when the tube is pinched and the fluid evacuated. In the absence of a double catheter, a single instrument may be used; the bladder is filled and the fluid is allowed to flow out, and the process is repeated until the bladder has been filled and emptied a number of times. This procedure, practised once or twice daily, gradually distends a contracted bladder and diminishes its irritability. The irrigation fluid may be hot normal salt solution; boric acid, ℥ij–iv, to water, Oij; or methyl-blue (pyoktanin), gr. xv, to water, Ojss, night and morning. If the urine contains pus, employ a two per cent. solution of ichthyol, five or six times daily; the strength may be gradually increased to five per cent. after subsidence of acute symptoms. The strength of the solution at the beginning should not exceed one-half of one per cent. S. D. Powell advocates irrigation of the bladder with a solution of carbolic acid 1 to 30, followed by irrigation with alcohol; subsequently a 2 per cent. solution of the carbolic acid is employed. Protargol 1 to 10 per cent., mercurol 2 per cent., zynol 3 per cent. (zinc acetate and aluminol 1 to 4), are also highly extolled. Lutaud advocates throwing into the bladder,

after irrigation with a boric acid solution, four ounces of tepid water, to which is added a teaspoonful of the following emulsion:

℞. Iodoform, ... ℥j
Glycerin., ... ℥x
Aq. destil., ... ℥v
Tragacanth., ... gr. iv. M.

This preparation should be introduced and permitted to remain. In necrotic and suppurative cases cleanliness is of prime importance. The bladder should be frequently irrigated. The frequent ichthyol irrigation is rapidly curative. The cavity of the bladder may be explored by dilating the urethra and introducing one of the vesical tubular specula used by Kelly. With a good light the cavity can be carefully inspected and applications, such as silver nitrate, gr. x–xxx, to aq. destillat., f℥j, made directly to the affected area. In the use of these stronger applications, touching the affected or ulcerated points with the solution should be followed by irrigation with a salt solution.

In subacute and chronic cystitis Clark introduces a vesical balloon of thin rubber. This balloon is connected with a thicker

Fig. 279.—Double-current Catheter.

rubber tube, provided with a cut-off valve. Before using, it is boiled in a boric acid solution, and its surface is coated over with a mixture of gelatin and ichthyol, ten per cent., or bismuth and zinc, salicylic acid, or weak bichlorid. The mixture is melted and poured over the bag, which has been rolled in the shape of a suppository. With a slender pair of forceps the balloon is introduced through the speculum. It is then inflated by a bulb syringe, the number of bulb pressures required to fill it having been previously determined. The balloon remains *in situ* twenty minutes.

Guyon, in bad cases, advises that the bladder should be irrigated under anesthesia with a solution of boric acid or sublimate, (1 : 10,000) and cureted with a medium-sized curet. The finger in the vagina as a guide enables him to go over the base and sides, while the hand over the abdomen aids in reaching the anterior surface; lastly, the urethra is scraped, the

irrigation is repeated, and a self-retaining catheter is introduced and retained some fifteen or twenty days.

Camero reports twenty-nine cases thus treated, of which nineteen were successful. Le Clerc-Dauday follows cureting by irrigation with a solution of chlorid of iron, and later by instillation of a 1 per cent. solution of silver nitrate. In serious tubercular cases in which pain and tenesmus are very marked *cystotomy* may be employed. It places the bladder absolutely at rest. A sound or bougie is passed through the urethra and used to depress the anterior vaginal wall while an incision is made through the septum. The vaginal and vesical surfaces are united by sutures to prevent the opening from closing. This procedure deprives the patient of control of the bladder contents, and requires the provision of an apparatus or receptacle for the urine.

With the removal of the gangrenous mass, the bladder should be irrigated with a boric acid solution (4 : 100) or a formalin solution (1 : 5000). A graduated irrigator is preferably employed, and not more than three or four ounces should be injected at one time. This may be pressed out, and the fluid again allowed to flow in, repeating this twenty times. The irrigation should be performed four times daily. It is surprising in these cases of extensive septic inflammation to note the subsequent power to retain the urine.

355. Ureteritis is inflammation of the ureter, and may be acute or chronic. It generally begins in the mucous membrane, extending through the wall of the canal, so that the ureter presents the palpable sensation of a thick, rigid cord.

Causes.—The disease, according to Mann, is produced by a number of causes: first, injuries during parturition; second, from previous disease of the bladder; third, gonorrhea; fourth, suppuration in the pelvis of the kidney; fifth, pelvic disease, such as pelvic peritonitis, cellulitis, and tumors; sixth, abnormal conditions of the urine; seventh, tuberculosis, to which may be added an eighth—the passage of calculi.

356. Acute ureteritis is often mistaken for intestinal colic, pain from renal strain, catarrhal appendicitis, or acute catarrhal salpingitis. The patient has a sudden attack of abdominal pain in which the distress is limited to, or more pronounced upon, one side, or but slight upon the other. The pain is intermittent, with not infrequently severe paroxysms. General abdominal tenderness is probably absent, while there is noticeable tenderness upon deep palpation upon the affected side, which in the beginning is more marked near the pelvis of the kidney. The site of most marked tenderness may be situated at McBurney's point. As the inflammation subsides the pain

disappears, and may be recognized at a point an inch above Poupart's ligament. Originating in the back, it can not be differentiated in the early stage from colic occasioned by renal strain. When complicated by intestinal disorder, it may be recognized by its characteristic progress from above downward, the appearance of vesico-ureteral tenderness, and the urinary disturbance. The condition may terminate in recovery or may result in the chronic form.

357. Chronic ureteritis is characterized by frequent desire to urinate, which is more marked while erect, especially when standing, and is not wholly relieved by retaining the recumbent position. The patient is obliged to arise from one to many times a night; the discharge may or may not be painful. Frequently, the desire to evacuate the urine will be imperative, and the urine will gush forth before she can secure privacy. In some cases she complains of bearing down, greatly increased by standing, which disappears after a few hours' rest in bed. Palpation may afford no sign, except a slightly thickened cord, or a rigid mass almost the size of the finger, pressure along which will cause a discharge of urine with such power as to drive it some distance from the urethral orifice. The necessity for a cystoscopic examination of the bladder will depend upon the severity of the attack; when attended with much pain, it should be made. An alteration of the vesical mucous membrane in and about the orifice of the ureter will be recognized.

This alteration may vary from a slight eversion and gaping of the orifice to one in which the orifice is an oval opening upon the summit of a mound of angry looking mucous membrane. The mucous membrane in the immediate vicinity may be normal, but is generally red and injected, even roughened and eroded.

The urea is said to be decreased upon the affected side.

The urine may be secured for examination by catheterizing the ureters or by the introduction of the Harris double catheter.

Treatment.—General treatment consists in the careful regulation of the diet, from which should be excluded strawberries, asparagus, and stimulants; tomatoes, onions, and cabbage should be used sparingly and with caution. The food should be largely albuminous, of which skimmed milk may often with advantage form its base. Large quantities of water, alkaline diuretics, or the alkaline waters are useful. In acute and subacute conditions the patient is best in bed. The nutrition should be maintained by general massage.

Local applications are advantageously made to the inflamed orifice of the ureter and to the eroded surface about it. A solution of silver nitrate (gr. x–xxx to f℥j) produces good results. It should be applied through a speculum directly to

the affected surface, after which the bladder should be irrigated with a normal salt solution.

When the inflammation of the canal is extensive, the disease may be treated by irrigation through a ureteral catheter.

In tuberculous disease, which is generally secondary to disease of the kidney, the affected kidney (the other having been demonstrated to be healthy) should be extirpated, and with it the ureter.

INFLAMMATION OF THE CERVIX AND BODY OF THE UTERUS.

358. Classification.—The classification of uterine inflammation has been and still is a difficult and perplexing problem. Various views have been presented. The existence of inflammation of the endometrium, except in acute conditions, has been denied. The so-called chronic inflammation is denominated catarrh and uterine congestion, and is frequently attributed to peri-uterine inflammation. This statement would seem a distinction without a difference, and results from failure to appreciate the varying character of inflammatory changes in different tissues. The continuous mucous membrane is exceedingly vulnerable to the possibilities of infection. The irritation thus produced results in the production of inflammation. Its violence and extent will depend upon the virulence of the poison and upon the resistance of the patient. It may vary from a slight inflammation involving the cervix only to one which extends to the entire uterine cavity, with infiltration of the submucous structures, becomes interstitial or parenchymatous, not infrequently, in virulent attacks, passes through the wall to its surface and causes perimetritis. In our early classification we spoke of metritis, in the sense of inflammation of the entire organ; when it is confined to the lining membrane, it is called endometritis. When involvement of the deeper structures occurs it is known as parenchymatous or interstitial metritis, and as perimetritis if the peritoneum becomes involved. The latter condition is generally described as pelvic peritonitis, because, although inflammation can reach the peritoneum as described, it more frequently does so by the progress of the inflammation through the tubes, and the inflammation is much more extensive.

The arrangement of the cervical mucous membrane renders it evident why inflammation may be confined to the cervix, although in puerperal women it is very prone to extend to the body.

The various classifications are based upon clinical phenomena, pathologic changes, and causal relations. The ideal

classification is that of Doderlein, into two divisions: first, inflammation produced through the influence of micro-organisms; second, inflammation independent of their influence. The former is subdivided into: (*a*) septic and saprophytic; (*b*) gonorrheal; (*c*) tubercular; (*d*) syphilitic; (*e*) diphtheric. The brevity of our knowledge of the influence of micro-organisms makes a careful differentiation difficult, but we are scarcely in a position to assert that there is any inflammation that is absolutely independent of bacterial production. My experience as a teacher has led me to discard the classification based upon the clinical phenomena, because it is difficult to associate therewith the pathologic relations. For this reason I propose to present the simpler and more frequently employed classification into acute and chronic, the latter subdivided into cervical catarrh, or endocervicitis, endometritis, and metritis. Acute endometritis affects both body and cervix. The chronic inflammation can be localized in the cervical mucous membrane. The classification of uterine diseases is still further complicated by the physiologic changes which occur in the uterus as a result of menstruation. Thus, the uterine mucosa undergoes a periodic hypertrophy and degeneration, and it is often difficult to differentiate between the physiologic condition and early pathologic processes.

359. Endocervicitis; Chronic Cervical Catarrh.—Cervical endometritis is an inflammatory process which affects not only the cervical canal, but the entire cervix. The symptoms and appearance of the disease differ greatly in the unmarried or nulliparous and the multiparous woman, and it manifests itself as inflammation of the portio vaginalis or of the cervical canal. In the former, the connective tissue of the vaginal portion of the cervix shows decided small-cell infiltration; the blood-vessels, especially the capillaries, become dilated and turgid with blood. Sometimes they become so distended as to form varicosities, resembling hemorrhoids. Immediately beneath the epithelium, the connective tissue is found rich in cells which later become converted into granular tissue. The squamous epithelium of the surface is in many places infiltrated with leukocytes, and it undergoes hypertrophic changes from the increased blood-supply. Numerous papillæ are formed, which are covered with a single layer of epithelium, which permits the red color to show through and the surface to present the appearance of an erosion. (Fig. 280.) This condition is generally known as simple erosion, and it more usually involves the squamous epithelium of the vaginal portion of the cervix. When the external os has been lacerated, the lips will often be widely separated and gaping. The mucous membrane is everted and presents irregular granular

patches which protrude beyond the os. Such a condition was formerly regarded as ulceration. Examination of a patch shows the apparently raw surface covered with epithelium. The increased blood-supply and the infiltration of the tissue with lymphoid cells causes the cervical lining to roll out of the os and rest upon the cervix like a fungus. Such a reddened, everted surface is sometimes known as granular or papillary erosion. At first the glandular structure is not involved, but eventually hyperplasia of the glandular epithelium results and there is an increase in the number and size of the glands. (Fig. 281.) The latter condition is more limited to the superficial structure, which seems to be taken up with glandular tissue, to the almost complete exclusion of the connective. In the

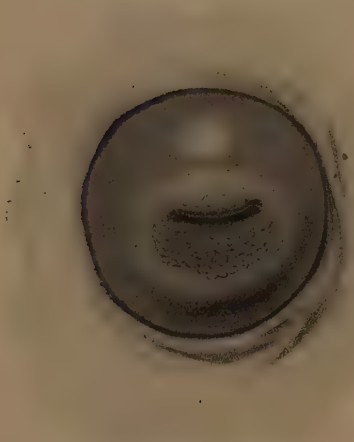


Fig. 280.—Simple Papillary Erosion of the Cervix.

Fig. 281.—Simple Papillary Erosion with Enlarged Follicles.

former, the glands enlarge and project through the structure of the cervix, sometimes even lifting up the squamous layer. The accompanying hyperplasia of the connective tissue may cause more or less constriction of the gland ducts, and in certain places they may be completely closed, thus resulting in the dilation of the glands and the formation of cysts. These cysts are known as retention cysts or ovules of Naboth. (Fig. 282.) They form nodular projections around the external os or can project deeply into the cervical tissue, projecting upon the vaginal surface at some distance from the external os. As the vaginal portion in the normal condition possesses no glands, it is evident these have been either extruded from the os with the

hypertrophied mucous membrane, or have pushed through the structure of the cervix in the manner already described, and may lead to an extensive cystic degeneration of its structure. Infection may result in the formation of abscesses, or the gradual distention may lead to rupture of the cyst, producing what is known as follicular erosion, in which the greater portion of or the entire cervix may be involved. The increased glandular secretion, mixed with the transudation from the eroded surface, produces a very profuse leukorrheal discharge. The protruding structure often is so marked as to render its origin uncertain, but it evidently arises from the proliferation of the epithelial lining of the cervical glands. Chronic inflammation of the

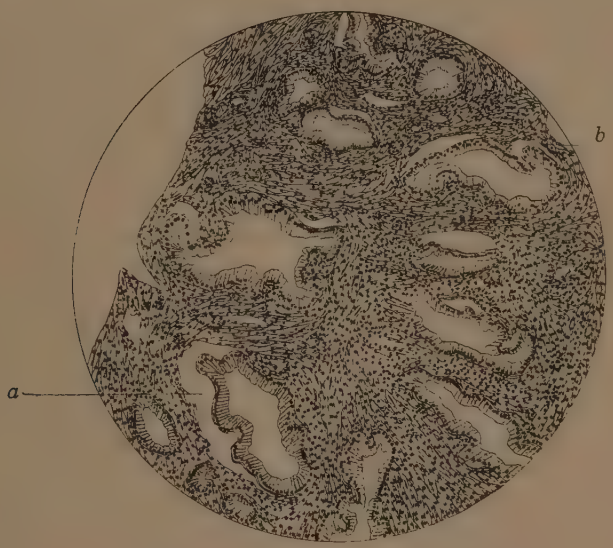


Fig. 282.—Chronic Endocervicitis.

a. Dilated gland forming cyst of Naboth. *b*. Detachment of glandular epithelium after absorption of fluid.

connective tissue occasionally causes such hyperplasia as to greatly increase the size of the cervix. In the nulliparous the cervix forms either a rounded mass, which increases the size of the cervix in all directions, or the latter may become so elongated as to produce a condition resembling prolapsus, and hence known as pseudoprolapsus. In previous laceration of the cervix only one lip may have undergone this hyperplasia, or both lips may be involved, when they will be widely everted and turned outward and backward, reminding one of the top of a celery stalk. The glands over such a surface are likely to

become obstructed and produce retention cysts, which are recognized as firm, pea-like masses beneath the finger. Occasionally such cysts form abscesses or rupture, and with the proliferating epithelium present an extensive raw surface which may be mistaken for carcinoma. A number of cysts in close approximation may become united through the absorption and breaking-down of the intervening septa and thus form one large cyst. Puncture of the cyst permits the escape of a large quantity of viscid fluid rich in corpuscles, with subsequent contraction and obliteration of the cavity.

From the discussion, it can be readily inferred that the inflammation involves all the structures of the cervix, the epithelium, the glands, and the connective tissue, and this varies in its form and manifestations according to the predominance of the structure involved. When the glands are extensively involved, the cervix presents what is known as cystic degeneration. The increase of connective tissue results in what Thomas has so aptly described as areolar hyperplasis or cervical sclerosis.

360. Causes.—Inflammation of the cervix arises from extension of inflammation from the body of the uterus, the vagina, and the vulva, as a result of excessive coition, laceration, injuries during instrumental and digital examination and manipulation, and from puerperal and gonorrheal infection. The cylindrical lining of the cervix is particularly vulnerable to infection, especially after laceration, when exposed to friction against the walls of the vagina, and to injury during the act of coition or examination. It is rare to have inflammation of the body of the uterus without involvement of the cervix. The latter is prone to occur because the uterine discharges flow over the cervical mucous membrane and irritate it. Endocervicitis is particularly likely to be produced by congestion of the uterus in association with flexions, and especially retroflexion. In retrodisplacements, separation of the lacerated surfaces is favored, and the delicate cervical mucous membrane is to a greater degree exposed.

361. Symptoms.—The principal symptoms of cervical inflammation are leukorrhea, pain in the back and loins, aggravated by exercise or standing, irregular menstruation, and sterility. Leukorrhea is the most important symptom. The normal secretion from these parts is insufficient to attract attention. When it is excessive, it becomes known as leukorrhea, or, in popular language, the whites. A temporary discharge—a transparent leukorrhea, like white of egg—not infrequently occurs preceding and following the menstruation, due to temporary congestion. The secretion from the cervical glands is clear and viscid, resembling white of egg. It be-

comes white when mixed with mucus-corpuscles, and yellowish when pus-corpuscles are present. Not infrequently it is tinged with blood, which escapes from the delicate vessels of the newly formed vascular tissue. Pain is aggravated by walking, standing, riding, or anything which increases the friction between the cervix and the vaginal walls. Menstruation is irregular and there is generally an increase in the quantity of the flow, probably produced by an extension of the inflammation to the endometrium. Sterility is often present. In the nulliparous woman suffering from endometritis the cervical canal is filled by a plug of mucus, which may afford a bar to conception. In the multiparous woman the presence of cervical inflammation may render the woman less susceptible to pregnancy, but it is not, however, considered an absolute obstacle to conception.

362. Physical Signs.—The appearance and outline of the cervix differ in the nulliparous and in the multiparous woman. In the former it is puffy and large; the os being soft and velvety. The patient will complain of pain when the cervix is moved or pressed. In the multipara the cervix is generally lacerated; its margins are soft, velvety, and eroded, or hard, presenting pea-like nodules, polypoid projections, cystic masses; or the os may be gaping, so as to permit the introduction of the finger nearly to the internal os. The mucous membrane is irregular, not infrequently presenting longitudinal ridges. Digital examination affords an idea as to the position and relation of the cervix, and as to its condition, whether lacerated or otherwise. The digital examination should be supplemented by the use of the speculum, the latter being used to confirm suspicions which have been engendered by the digital examination. The Sims speculum is preferable, as it affords less displacement to the parts and permits more thorough and complete inspection. In the nullipara the os will be filled with a plug of tenacious mucus surrounded by a patch of excoriated tissue, particularly upon the posterior lip, from which the outer layers of the epithelium have been desquamated. In the multipara a laceration will probably be seen. Its presence is often overlooked, because the fissures are filled up with indurated cicatricial tissue. The use of tenacula to turn in the surfaces demonstrates its existence. The bluish-red ovula Nabothi may be readily seen as nodular projections upon the surface.

363. Diagnosis.—Cervical catarrh is readily determined from vaginal inflammation by the use of the speculum. In the former a plug of mucus will fill up the cervical canal and project from it, being so viscid and tenacious that its removal is accomplished only with difficulty. To thoroughly cleanse

the surface of mucus it may be necessary to use a curet. The mucus in the interior of the dilated glands should be removed by puncture and digital pressure. When the cervical discharge is insufficient to render it visible, Schultze's method may be employed. He gives the patient a vaginal douche, introduces a speculum, thoroughly cleanses the surface, and places a tampon soaked with a solution of tannin against the external os. This applied at night and removed through a speculum the following morning, the character and quantity of the discharge from the cervix can be noted. The differentiation between endocervicitis and endometritis is still more difficult. In many cases, indeed, we may not be able to say definitely that a cervical catarrh is not associated with more or less inflammation of the endometrium. The enlargement and thickening of the cervix demonstrate that it is the seat of inflammation. It is sometimes difficult to differentiate between inflammation and malignant disease of the cervix. In the former the hypertrophy is more general and uniform, the tissues are more or less firm, but not hard, and show no inclination to friability. In malignant disease the cervix may at points be hard and indurated from the presence of an infiltrate which is more or less localized. An excavated ulcer may be present, covered with friable, easily broken-down tissue, which will crumble and become detached under the finger, while the base is hard and resisting. Hemorrhage and a profuse, foul-smelling discharge are prominent symptoms. When the condition is such as to leave one in doubt, a test excision of the tissue should be made and subjected to microscopic investigation.

364. Prognosis.—The curability of the condition is dependent upon the general health of the patient, the duration of the disease, and the extent of involvement. Not infrequently it will be found that these patients have passed through the hands of a number of physicians, and, therefore, extreme care must be exercised as to the prognosis. The result is less favorable when there is a large amount of secretion and apparently but little glandular degeneration.

365. Treatment.—First, constitutional: The patient should be encouraged to take outdoor exercise, and not infrequently change of air will prove of decided value. Tonics, such as quinin, iron, strychnin, arsenic, and the bitter tonics, will be of advantage. Indigestion should be corrected, regular action of the bowels secured, and sexual rest directed.

Second, local treatment: In the nullipara, it is advisable to give hot vaginal douches through a fountain syringe under moderate pressure for ten to fifteen minutes each night, having

the patient preferably in the recumbent position. Doubtless in some cases the hot water thrown with force from a bulb syringe against the cervix will have a more marked modifying influence upon the hyperplastic process and, therefore, it should supplant the fountain syringe. The temperature of the water should be from 110° to 115° F., and the patient should be advised to remain in bed following the douche. Astringents can be added, such as a solution of zinc sulphate (1 to 2 drams to the pint) or corrosive sublimate (1 : 4000). The os, when narrow and contracted so that the drainage is ineffective, should be notched bilaterally with scissors, to permit the escape of the mucus. The lips should be trimmed, making a funnel-shaped opening (Figs. 283 and 284). When the secretion continues, local applications, such as tincture of iodin or carbolic acid, a saturated solution of iodin crystals in carbolic acid 95 per cent., can be employed; the former in mild, the latter in more severe cases. Heywood Smith advises acid nitrate of mercury; De Sinety, chromic acid. In making an application, the mucus should first be removed from the canal with a cotton-wrapped applicator or a blunt curet. This step is important to prevent the application being coagulated by the mucus without reaching the affected surface. After the ap-

Fig. 283.—Lines of Inicision for Contracted or Pinhole Os.

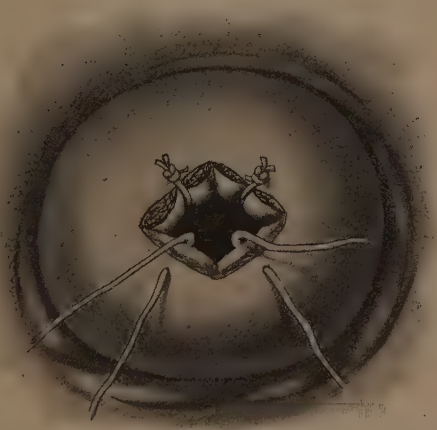


Fig. 284.—Union of Vaginal and Cervical Mucous Membranes.

plication any surplus fluid should be removed, and a tampon of cotton or of gauze saturated with glycerin should be placed beneath the cervix. A 25 per cent. solution of ichthyol in glycerin, or ichthyol in lanolin, of the same strength, may be applied to the cervical canal with a cotton-wrapped probe, or a small pledget of gauze or cotton anointed with it may be carried into the dilated cervix, or a tampon medicated with it may be applied to the eroded cervix. Ichthyol is advisable because of its germicidal action. The application of such a tampon will not infrequently result in the desquamation of an epithelial cast, followed by a regeneration of the epithelium and restoration of a healthy appearance of the cervix. The application of a saturated solution of iodoform in ether is advised. Ether stimulates contraction of the glands and forces out the secretion, while the iodoform remaining acts as an antiseptic. In the multipara endocervicitis is not infrequently complicated by retroflexion, subinvolution, or laceration of the cervix. The first consideration should be to relieve congestion by hot astringents, antiseptic douches, or the use of glycerin tampons. The displacement should be corrected and the organ should be maintained in a proper position by a tampon or by the use of the pessary. When the cervical mucous membrane is much everted and the lips are widely separated by laceration of the cervix, the relief of the engorgement and congestion can be overcome by the employment of Emmet's operation. Frequently, the uterine congestion may be decreased by local depletion through scarifying or puncturing the cervix. This procedure is of special value where a number of glands of Naboth have become obstructed and have formed retention cysts. Puncturing the cysts and introducing tincture of iodin or carbolic acid produces a sufficient amount of inflammation to obliterate the cavity and remove the pressure. In very obstinately chronic cases destruction of the diseased glandular tissue is imperative. It may be accomplished by the use of the Paquelin thermocautery or by various caustics. Skoldberg recommends zinc alum sticks, which are made by running together into molds equal parts of zinc sulphate and alum sulphate, forming a small stick, which is carried into the cervix and retained by a plug of wadding in the vagina, which also receives the discharge. Silver nitrate in solid stick was formerly much used for this purpose. The latter method of treatment is required only in exceedingly severe cases, and its application should be extremely limited. It cures by destruction of the mucous membrane and glandular structure, substituting for them cicatricial tissue. It should not be used where there is danger of the cervical canal becoming so contracted as to

interfere with drainage from the uterine cavity. Colpe, finding that an inflammation of the cervix did not yield to the use of astringents and caustics, examined the secretion and found present mycotic spores, after which he used lactic and salicylic acids, with immediate relief.

Electricity has its advocates—the negative pole is introduced into the cervix, while the positive pole is placed upon the abdomen. It is questionable, however, whether this plan of treatment has any advantage over other caustic measures. The use of the sharp curet not only removes the glands from the cervical canal, but, as advocated by Thomas, scrapes away the arbor vitæ from the internal to the external os. This measure not infrequently has to be repeated a second or even a third time before relief is complete. When there is very marked eversion, or an eroded, deeply fissured surface, Schröder's operation should be performed. This consists in the formation of a single flap in each lip. The method of procedure has been described. (Section 268.) Martin removes a larger amount of the cervix, and combines amputation with excision. He splits the cervix into two lips, cuts through the cervical mucous membrane on the posterior lip above the diseased portion, then removes as much of the lip as is necessary, and stitches it. The anterior lip is treated in the same way.

366. Acute Metritis and Endometritis.—In acute inflammation the pathologic changes are not confined to the endometrium, but rapidly involve the entire organ. In the non-puerperal uterus they are excited by infection from gonorrhea, or follow trauma, induced by exploratory operative procedures, or result from exacerbations of the chronic state. The non-puerperal cases are rare and scarcely ever fatal or sufficiently threatening to require hysterectomy. Such an inflammation is generally brought on by an infection which has occurred during parturition or abortion, and, consequently, is more an obstetric than a gynecologic infection.

Infection is favored:

1. By protracted labor during which the tissues have been subjected to bruising or laceration.

2. Through want of skill or of cleanliness in the practice of manual or instrumental procedures.

3. From the retention of clots or of portions of placenta or decidua after labor or abortion.

4. By the presence of septic germs in the genital canal prior to the interruption of gestation or by their introduction during the process of delivery or in the subsequent convalescence.

367. Pathologic Alterations.—The infection is originally implanted in the degenerated mucous membrane, the blood-clots

of the uterine sinuses, the site of the placenta, or in retained portions of the placenta or decidua. Intense hyperemia results, with alterations in all the tissue elements. The gland lumina are dilated by the increased secretion and proliferation of the glandular epithelium. Inflammatory infiltration takes place into the tissues with subsequent degeneration and destruction of the cellular elements. The mucous membrane becomes greatly swollen and edematous. The epithelium is found granular and desquamating. The blood-vessels become engorged and thrombosed. Inflammatory material is poured into the cellular tissue, which may terminate in abscess formation, either in the wall or sinuses or both.

These pus pockets, at first small and localized, increase in size, the intervening walls break down, and an abscess of considerable size may form, which may rupture into the uterine cavity and thus terminate favorably, or a large portion of the uterus may become gangrenous, causing serious detriment to the health, and even loss of life. In an autopsy upon a patient who died under my care in the Philadelphia Hospital, the entire fundus was found to have been completely destroyed.

368. Varieties and their Source.—The symptoms will be found to depend upon the character of the infection, and this can be divided into sapremic and septicemic. Sapremic infection is induced by the action of the saprophytes upon retained blood-clots and portions of the decidua or placenta, which cause decomposition of the retained tissue, with the subsequent absorption of the decomposing products. Decomposed material, when undisturbed, presents a soil favorable for the development of septic infection. The latter condition, however, occurs much more frequently as a primary disorder from the entrance of pathogenic germs through fractures of the mucous membrane of the uterine body, cervix, vagina, or vulva. We have already asserted that inert pathogenic germs which inhabit the vagina can, by changed conditions, be stimulated into activity, but they are, however, more frequently introduced from without, through failure of the physician or nurse to observe proper antiseptic or aseptic precautions.

369. Symptoms.—Sapremia occurs in from three or four to ten days subsequent to delivery. The onset of the trouble is rather sudden, and is manifested by elevated temperature and repeated rigors. The patient may have severe chills, daily temperature varying from 102° to 105° F. The lochial discharge may be absent or, if present, is exceedingly foul. The patient generally manifests but little tenderness upon pressure. Manipulation over the uterus may be followed by contraction and the expulsion of a large offensive mass, after which the

patient will improve, or she may have quite profuse bleeding. Digital examination discloses the presence of retained masses and affords evidence of their decomposition. The onset of septicemia is more insidious, but the symptoms occur earlier. The reaction induced by septicemia will depend upon the condition of the patient, the time of the infection, and the virulence of the infective poison. As early as the second or third day, not infrequently upon the first, the patient will exhibit an elevation of temperature, which gradually increases. She suffers from pain or tenderness in the lower abdomen, which may be so marked as to confine her to the dorsal decubitus, with her limbs flexed and unable to exercise the slightest muscular action, because of pain. Not infrequently, the bladder becomes greatly distended; the pulse is rapid, varying from 110 to 140; respirations frequent, and the temperature displays a range from 101° to 107° F. The lochial discharge is arrested or free, and may be mucous, muco-purulent, ichorous, or sanguinolent. It may have a stale, sickening smell or be almost free from odor. The cervix and vagina, upon inspection, may appear normal or highly inflamed, swollen and covered with glairy mucus, or exhibit patches of diphtheric exudate. The uterus is likely to be smooth, swollen, and exceedingly tender to pressure. The cervix will appear lacerated and boggy. The entire organ will be found enlarged, edematous, and flabby. When the inflammation is confined to the uterus, the organ will be tender and enlarged, but not so sensitive as to preclude palpation. If, however, the peritoneal coat is involved, the pain and tenderness will be very acute; the limbs are drawn up to protect the abdomen from pressure of the clothing and to relieve the traction upon the abdominal wall. The progress of the disease will depend upon the virulence of the poison and the resistance of the patient. In the sapremic condition the source of origin of the disease may be expelled and the patiently rapidly progress toward recovery. A patient suffering from septicemia may be so fortunate as to secure immunity against its further progress, and slowly recover. The disease may become localized and a pus collection be spontaneously or artificially evacuated, or the general system may become so infected that, notwithstanding every therapeutic procedure, the patient succumbs. An unfavorable prognosis is indicated by a persistent high temperature, a pulse-rate continuously above 130, and the absence of localized foci. If the serious symptoms subside and the general condition of the patient improves, but a rapid pulse-rate continues, associated with an evening temperature of 100° F. or over, the patient should not be regarded as out of danger. This disorder was formerly known as puerperal

fever and supposed to be due to some obscure poison characteristic of the condition. The investigations of Semmelweis and others demonstrated that it was analogous to surgical fever and due to a similar cause. The disorder is hydra-headed in its manifestations and makes its invasion by one of three routes: Through the continuous mucous membrane of the body of the uterus and Fallopian tubes, to the peritoneum; through the blood-vessels or lymphatics. Thus we may have inflammation of the structure of the uterus, the Fallopian tubes, the ovaries, the pelvic cellular tissue or the pelvic peritoneum, or even all combined. Any of the veins of the body may become involved in the septic phlebitis, but the condition occurs most frequently in those of the lower extremities, causing the condition formerly known as milk leg, which we now recognize to be an infective phlebitis. It may manifest itself also by a severe lymphangitis. The disease may rapidly involve the general system, giving rise to profound symptoms of septicemia without any special localization.

370. Diagnosis.—The early differentiation between sapremia and septicemia is very important. The former, being associated with retained decomposing products, manifests itself several days after delivery. Symptoms develop suddenly in a patient who seemed to be undergoing a normal convalescence. The lochial discharge, where present, is exceedingly offensive. A digital examination discloses a clot, a portion of placenta or a portion of decomposing membrane, within the uterine cavity. These products, when removed, have a very offensive odor, and with their disappearance the symptoms rapidly subside. In septicemia the symptoms occur more insidiously, and at an earlier date following delivery, unless, however, the infection should have been implanted late. The occurrence of elevation of temperature following a delivery should be regarded as a danger-signal, which should cause the attendant to make a careful investigation of the history of the case, together with a judicious interrogation of the physical signs. The condition of the breasts should be ascertained, for not infrequently women have a high temperature concomitant with the establishment of lactation. The breasts become greatly distended, caked, and hard. The temperature of the patient reaches 105° F. or over. Not infrequently, the nipples may be the source of infection, which may lead to the occurrence of a mammary abscess. Typhoid fever and malaria are frequently mistaken for sepsis and *vice versa*. The possibility of these conditions should be excluded by a careful examination of the blood; finding in malaria the plasmodium and in typhoid fever the securing of a positive Widal reaction

and the examination of the urine, are considered sufficient evidence to establish the diagnosis. Furthermore, the typhoid bacillus may be found in the urine and also occasionally in the blood. A digital examination excludes sapremia when it reveals the walls of the uterine cavity smooth and free from any decomposing products. Intoxication from morbid products in the intestinal tract may sometimes closely simulate septicemia. It was quite recently my privilege to see with two young doctors, a young woman who was suffering from a very high temperature with some abdominal distention, in whom there were no signs of any localization of sepsis. The patient had been confined a week previous to the manifestation of symptoms. Examination disclosed the uterine cavity free from any decomposing material, and absence of tenderness over the uterus. The woman had had some fifteen foul-smelling stools during the last twenty-four hours. It was her first confinement, and there was a history of her having undergone a curetment some three years before. She had been very carefully managed during her confinement, with every aseptic precaution, and had been cared for by a well-trained nurse. The inference of the attendants was that she had had some local accumulation in a tube, prior to her confinement, from which this infection had developed. But as I found the uterus free from any tenderness or undue enlargement, no sign of infection in the vagina, and she had what seemed to me no tenderness or swelling about either tube or ovary, I reasoned, therefore, that if such local cause had existed, it should still show evidence of its presence, and in view of the very evident intestinal disturbance, I ascribed the symptoms to an intestinal infection, and suggested measures for its correction. The rapid subsidence of the symptoms and recovery of the patient confirmed the diagnosis.

Having reached a diagnosis in septicemia, by exclusion, it is then desirable to recognize and treat the local manifestations promptly. These we determine by the size and evidence of laceration of the uterus, the existence of patches of diphtheric exudation in the vagina or uterus, the possible form and progress of the infection. Metritis will be indicated by a large, swollen, more or less tender and boggy uterus; perimetritis or pelvic peritonitis by extreme tenderness in the lower portion of the abdomen, pain and anxiety of the patient, with a frequent, rapid, wiry pulse, and high, sometimes low, and even subnormal, temperature; the latter symptoms, moreover, rather increasing the danger. Phlebitis will be recognized by tenderness over the femoral and saphenous veins, as these are the ones in which the disease most frequently manifests itself.

Lymphangitis is often indicated by the existence of inflammation of the cellular tissue and by pain and tenderness over the lumbar or inguinal regions.

371. Prognosis.—Sapremia is a condition which usually terminates favorably. The removal of the putrid products soon results in the subsidence of the constitutional intoxication. It should not be forgotten, however, that the putrid material affords a favorable soil for the development and propagation of septic germs, so that when a patient comes under observation she may have been subjected to mixed infection. Under proper management, this condition generally terminates in recovery. Septicemia is an exceedingly dangerous disease; its manifestations are so various that often when the patient survives she may be in a condition which cripples her for life and at the expense of serious sacrifice of important organs. The condition demands the most careful scrutiny of the progress of the disease, with the resort to radical procedure when it is manifest that local foci are continuing its propagation.

372. Treatment.—Prophylaxis is the most important treatment, but is so closely associated with the work of the obstetrician that we will not consider it. A woman who develops symptoms leading one to suspect the occurrence of a septic process should at once be subjected to careful investigation. This careful scrutiny is advised in order to eliminate the possibility of other conditions being confounded with sepsis. Finally, a pelvic exploration should be made, and all decomposing products, such as blood-clots, portions of placenta, or remnants of decidua, should be removed. The patient should be placed across the bed; if the abdomen is tender, an anesthetic should be given, and two fingers introduced into the uterus, which, with the hand over the abdomen, will permit the entire uterine cavity and wall to be thoroughly explored and all products and debris removed. The procedure not only removes the debris and contents of the uterus, but favors the pressing out of infected clots from the blood-vessels and uterine sinuses. This manipulation should be followed by intrauterine douches of sterile normal salt solution, or, better still, a 1 per cent. saline solution, made up of 2½ grains sodium bicarbonate to 7½ grains of sodium chlorid to the 1000, or formalin solution 1 : 1500 : 1000, or sublimate solution 1 : 3000. When the uterine cavity is clear of decomposing masses and other causes are excluded, we are justified in accepting the diagnosis of septic infection, as contradistinguished from putrid intoxication. In septicemia, intra-uterine manipulation often will be unproductive of any favorable result. The micro-organisms have already penetrated beyond the reach of any local measures.

Curetment, by affording fresh avenues for infection, is harmful. The uterine cavity should be irrigated through a double-current tube three, four, or more times daily with a hot 1 per cent. saline solution, or solutions of formalin or bichlorid. The latter solution (1 : 3000) should be followed with normal salt solution to avoid the danger of mercuric poisoning.

The removal of decomposing products, irrigation of the uterus, and the internal administration of salines in sapremia, or putrid intoxication, usually establishes early convalescence. Not infrequently, however, there will be a marked rise of temperature after such a procedure, but it soon subsides. Sepsis, on the other hand, is caused by micro-organisms, which have entered the blood, and kill, not so much by their presence, as by the toxins or poisons which they generate. Researches have seemed to demonstrate that these toxins, obtained from pure cultures of the organisms and injected into the circulation of some of the lower animals, soon generate an antitoxin which acts as an antidote to the original poison. My early experience in the treatment of sepsis by the administration of the anti-streptococcic serum was such as to lead me to place greater reliance upon its efficacy in affording prompt immunity than the later experience of myself and colleagues would seem to justify. In severe cases as much as ten cubic centimeters (two and a half drams) in twenty-four hours should be employed. In less severe cases smaller doses, three to six cubic centimeters, can be employed. The dose should be administered daily until the abnormal symptoms subside. The advocates of the employment of serum therapy in the treatment of puerperal sepsis are doubtless correct in their demand that the serum must be fresh. The want of success may have been due to this cause, as many have employed the imported serum of Marmorek. A requisite to accuracy is the careful bacterial investigation of the secretions, for it would not be reasonable to expect a satisfactory result by the employment of anti-streptococcic serum in a staphylococcic infection. To be most effective, it is most important that the serum should be administered early and in good dose. The strength of the patient, and her consequent ability to fight the disease, should be maintained by the administration of supporting remedies, by a nutritious, easily digested diet, and by the judicious use of stimulants.

Quinin may be given in suppository (gr. v–x), three or four times daily; strychnin, atropin, tincture of digitalis, digitalin or adrenalin chlorid solution (1 : 1000) should be administered hypodermically, as the indications demand. Action of the bowels should be secured by the proper use of salines, which

facilitates the elimination of the infective products, though care should be exercised to avoid undue depletion.

Intravenous Injections.—The intravenous injection of normal salt solution has been of great service to the surgeon in overcoming shock, and in carrying patients over a critical condition. It has been demonstrated, also, that this procedure is serviceable in low septic conditions by increasing the volume of the blood, thus diluting toxic material, promoting secretion, and the consequent elimination of poisonous products. The combination of chlorid of sodium with bicarbonate of sodium, making a 1 per cent. saline solution which should be in the proportion of $7\frac{1}{2}$ parts of the chlorid of sodium to $2\frac{1}{2}$ parts of bicarbonate of sodium, has proved especially efficacious in septic conditions, as it increased the phagocytes and the consequent ability of the patient to resist the progress of the infection.

The brilliant results achieved by Professor Baccelli, in 1889, in the treatment of pernicious malaria, by the intravenous injection of hydrochlorid of quinin, has directed the attention of the profession to the intravenous injection of germicides. Baccelli later instituted the intravenous injection of corrosive sublimate in the treatment of syphilis, after the administration of mercury by other methods had failed. His experiments on the lower animals demonstrated the fact that albuminate of mercury, which was first formed, was redissolved in an excess of albumin.

As it is known that the micro-organisms enter the blood, the introduction of germicidal agents into this fluid to render it an unfavorable soil for their multiplication is a plan which naturally appeals to the scientific mind. The difficulty has been to secure some agent which shall prove destructive to the specific germ in the hemal circulation, without inducing degenerative changes in the circulatory fluid. Carbolic acid, sublimate, and formalin have all been recommended as suitable agents for this purpose. In a recent case in which the conditions were such as to make it evident that death was imminent, unless the poison could be arrested, I injected $\frac{1}{8}$ of a grain of sublimate in five hundred centimeters of normal salt solution. The patient the following day developed an infarct which cut off the circulation in the end of the nose, and she died at the end of forty-eight hours. As air, however, had entered, due to the faulty apparatus employed, it is not justifiable to condemn the bichlorid as the cause. Formalin has been especially commended of late, particularly by Barrows, of New York, and Maguire, of London. The latter, in his experiments, has injected solutions as strong as 1 : 500 into

himself. This was followed by hematuria, albuminuria, cramp-like pains, and faintness. I have applied gauze, wet with formalin solution (1 : 1500-2000), to the peritoneum, with complete destruction of the endothelial covering of the involved surface, so that I should regard the injections of solutions of formalin, therefore, under 1 : 5000, as extremely dangerous, and as it has been claimed that it is germicidal in solutions of 1 : 200,000, a weaker solution still would seem preferable. As the simple injection of water into the blood-vessels causes degenerative changes in the blood-corpuscles, it would seem much wiser that these injections should be made in combination with normal salt solution. In cases, then, in which it is evident that the patient will succumb to the disease unless it can be arrested, we should feel justified in proceeding to extreme measures with the hope of affording relief; and with our present knowledge of conditions, I should favor the formalin in combination with a normal salt solution as being the least deleterious of the agents we can employ. I would advise that it be given in solution of 1 : 10,000.

Localization of infection may result in abscess formation in the uterine wall, in the pelvic cellular tissue, in the tube, in the ovaries, or in multiple abscesses in various portions of the body. The manifestation of such a local collection should be deemed an indication for prompt surgical interference. The treatment necessarily must depend upon the site and extent of the lesion. If an exudate or inflammatory collection can be reached by a vaginal incision, through which the contents of the cavity can be evacuated, its sac enucleated and removed, or the cellular tissue opened up and drained, more serious destruction of tissue can often be avoided. Where the uterus remains large and extremely tender, or presents indications of localized peritonitis, and the condition of the patient will permit, the abdomen should be opened and hysterectomy performed. The excision of a section of an infected vein has been successfully performed, but one must be satisfied that the condition is not diffuse before resorting to such a recourse.

When the temperature is elevated, skin hot and dry, with tympanites and repeated vomiting, the most effective plan of treatment is to irrigate the stomach with hot normal salt solution, followed by intercolonic irrigation. The latter should be continued over several hours, or a quart of normal salt solution should be injected into the bowel every hour. The administration of large quantities of salt solution promotes elimination. The tongue and skin become moist, the secretion of urine increased, the pulse increases in volume, and the temperature subsides.

373. Chronic endometritis is an inflammation of the mucous membrane of the body of the uterus. It rarely, if ever, is the consequence of acute endometritis, but more frequently follows subacute processes and long-continued hyperemia. It is divided by Ruge into glandular, interstitial, and mixed, according to the structure of the mucous membrane most extensively involved. In all varieties of inflammation the entire structure of the membrane is necessarily more or less affected. With thickening of the mucous membrane the glands become elongated, dilated, bent, and tortuous. Cells become swollen and proliferated, resembling those of the decidua.

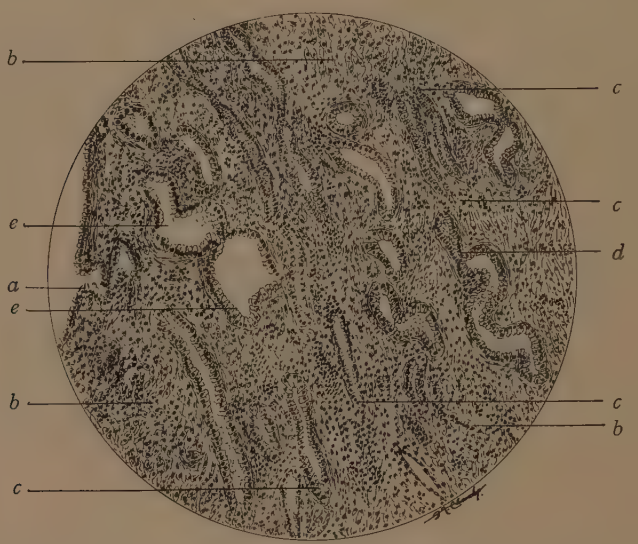


Fig. 285.—Interstitial Endometritis.

a. Free uterine surface. *b*, *b*, *b*. Hyperplasia of connective tissue. *c*, *c*, *c*, *c*. Obliteration of glands. *d*. Choking of gland from increase of fibrous tissue. *e*, *e*. Glands occluded and somewhat dilated.

The vessels of the deeper portion of the mucosa are dilated and in a state of congestion. The mucous membrane is not infrequently several times its normal thickness, soft, spongy, and easily scraped away. The surface presents vegetations or growths, which, according to De Sinety, are of three forms. In one, the tissue consists of dilated blood-vessels; in the second, of dilated, hypertrophied glands (Fig. 287); in the third, of embryonic tissue containing but few blood-vessels and only traces of glands. With these conditions are associated three kinds of discharge—sanguinolent, leukorrheal, and muco-purulent. As a result of the changes in the mucous membrane,

not infrequently portions project as polypoid masses, which consist of either glandular or vascular structure (Fig. 288). In this condition the mucous membrane is thickened and granular in appearance, and the state has been called villous degeneration, or endometritis fungosa. With cell proliferation in its connective tissue and the subsequent contraction of the gland, its structure is compressed and obliterated, so that the surface is almost free from glands. Or, again, the orifices of the glands' ducts in places become occluded and cysts result. The hyperplasia of the uterine mucosa in some cases results in the desquamation of the epithelial layers at each menstrual period. This desquamation may take place in the formation

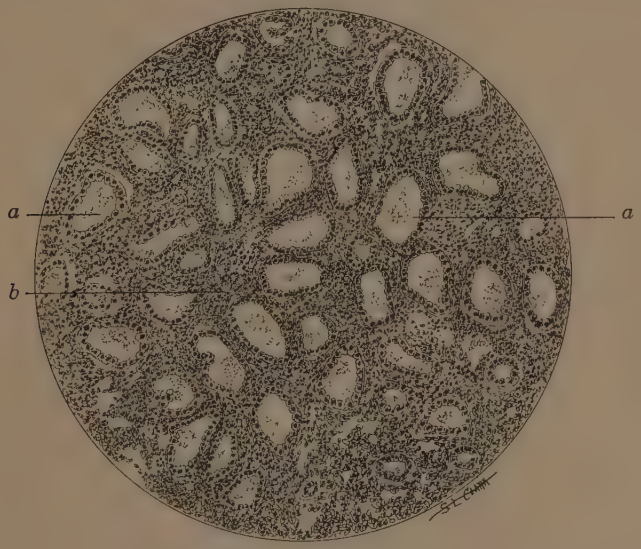


Fig. 286.—Hypertrophic Glandular Endometritis, showing Increase in Size and Numbers of Glands.

a, *a*. Glands dilated and containing secretion. *b*. Infiltration of leukocytes.

of shreds or in a complete cast of the uterus, in which the orifices of the Fallopian tubes and the internal os are recognized. This condition is known as exfoliative endometritis, membranous dysmenorrhea, or, probably better, menstrual decidua. (Fig. 289.)

374. Symptoms.—The disease arises after abortion or labor, as a result of an attack of uterine inflammation, or an attack of gonorrhea. Occasionally, it may begin insidiously and without any sign of a cause. It occurs more frequently in the multiparous, and is more common in the later menstrual life. Nulliparæ are not exempt; even virgins are sometimes affected—a condition known as virginal endometritis. This

especially occurs in narrowing or stenosis of the external os. A form of the disease occurs subsequent to the climacteric, when it is known as senile endometritis. Endometritis is characterized by the following symptoms: leukorrhea and

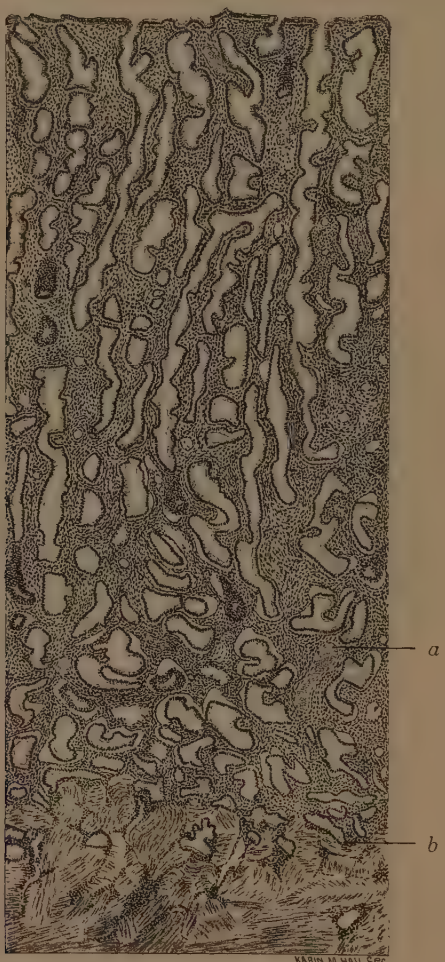


Fig. 287.—Hypertrophic Glandular Endometritis. Vertical Section through the Mucous Membrane.

a. Blood-vessel distended with blood-cells. *b*. Gland penetrating muscular wall.

menorrhagia. The discharge from the body of the uterus is less viscid than that from the cervix. It may be clear, but more generally is mucopurulent; occasionally it is tinged with blood, so that the patient imagines herself continuously un-

well. The discharge flows freely or there is an apparent accumulation. Retention of the discharge and its evacuation in considerable quantity occur when endometritis is complicated by retrodisplacements or when the os is small. The discharge may have an offensive odor and be so irritating as to give rise to extensive excoriation of the vulva. Excessive menstrual flow, or menorrhagia, may or may not be present. Occasionally, it will be so profuse as to occasion a suspicion of malignant disease and cause a profound anemia. The resulting loss of vasomotor tonus results in increased tendency to hemorrhage. Dysmenorrhea, or painful menstruation, is not so common as in disease of the appendages or in chronic metritis. It is especially marked when accompanied by the discharge of a

Fig. 288.—Polypoid Masses Associated with Chronic Endometritis.
a. Glands greatly dilated with destruction of the intervening septum.

menstrual decidua. The influence of endometritis upon conception is not fully determined, but the increased frequency with which women become pregnant subsequent to a curetment renders it evident that it has a restraining influence upon the occurrence of conception. Endometritis is a prolific cause for abortion.

375. Diagnosis.—The existence of leukorrhea or of irregular and profuse menstruation, associated with enlargement of the uterus for which no explanation external to the uterus can be found, justifies the suspicion of endometritis. The history of abortion, or prolonged convalescence subsequent to labor, con-

firms the suspicion. The use of the curet is of incalculable advantage in determining the diagnosis. Portions removed with the curet will show small-cell infiltration of the entire glandular tissue, without glandular hyperplasia, or marked hyperplasia of glands with proliferation of the glandular epithelium. The epithelial cells become enlarged and granular, lose their cylindrical shape and resemble the decidual cell. Endometritis, when uninterrupted, extends to the deeper structures, producing metritis. It predisposes to malignant change. When permitted to pursue an undisturbed course, it can involve the peri-uterine covering. Deposits occur in the cellular tissue

Fig. 289.—Membranous Dysmenorrhea.

about the ovary or around the orifice of the Fallopian tube, or the disease involves the pelvic peritoneum. Neglected cases result in cellulitis, salpingitis, ovaritis, peritonitis, the formation of abscesses, the destruction of tissue in the organs, and not infrequently, alas, in loss of life! Senile endometritis is associated with retention of secretion which decomposes, producing an exceedingly offensive odor, and arouses the suspicion of malignant disease (Dunning). The examination of such a uterus reveals its walls thinned; the mucous membrane consisting of a thin layer of connective tissue covered with a single layer of flattened epithelial cells.

376. Treatment.—Constitutional treatment is of marked value, and will be discussed with chronic metritis. Prophylaxis will require rigid asepsis during labor or abortion, as well as in making gynecologic examination. A rise of temperature or the suspicion of the retention of a portion of placental debris should be considered as indicating the necessity for thorough use of the curet, free irrigation, and, in many cases, gauze packing. Laceration of the cervix or of the pelvic floor should have early repair. All suspicious discharges must be removed by treating the cause. Before the third or fourth day a gonorrheal endometritis is best treated by frequent irrigation with antiseptic solutions, such as permanganate of potash (1 : 3000–2000), mercurol (1–2 per cent.), protargol (0.5–1 per cent.). If it has existed for some days, curet and pack with iodoform gauze. Careful antiseptic or aseptic cureting is the proper form of treatment in all forms of endometritis, whether complicated or uncomplicated. In serious cervical lesions, with much eversion and thickening of the mucous membrane, cureting should be associated with Schröder's operation upon the cervix. Drainage is of incalculable advantage in endometritis when complicated with slight catarrhal salpingitis. It will also prove serviceable in mild forms of periuterine inflammation. Cureting should be considered contraindicated in well-established pathologic changes in the adnexa and in chronic peri-uterine inflammation unless immediately preceded, at the same operation, by an abdominal incision for the correction of the pelvic lesions. In addition to curetment, intra-uterine treatment consists in the employment of antiseptics and caustics. Free drainage should be considered as a prerequisite to all intra-uterine treatment. The inflamed uterine canal is similar to a sinus. Unless the pent-up discharges have free vent, the irritation is aggravated. When the canal is patulous, large injections of a feeble antiseptic solution through a return-current catheter can be employed, such as formalin (1 : 2000), normal salt solution, or a two per cent. solution of bicarbonate of soda. The latter solutions, when used, are as salutary as the more distinctly defined germicidal agents. If the cervical canal is insufficiently large, it should be dilated with laminaria tents, after which irrigation should be practised. In mild cases the canal may be swabbed, by means of a cotton-wrapped applicator, with tincture of iodin; in more severe cases, with carbolic acid. When the mucous membrane is thickened, and tends to bleed or to furnish a profuse discharge, more active agents may be employed: silver nitrate, gr. xxx, to aq. destil., ℥ss-j; zinc chlorid, ℥j–iv, to f℥j; acid. chromic., gr. x–xxx, to f℥j; fuming nitric

acid, acid nitrate of mercury, tincture of chlorid of iron, pencils of silver nitrate, zinc chlorid, zinc sulphate, copper sulphate, or formalin. When strong caustics are used, precautions must be practised to protect the healthy vagina from contact with the solution. A mass of absorbent cotton should be placed beneath the cervix prior to the application, and the superfluous caustic should be removed by sponging before the pledget is withdrawn. Pencils are objectionable in that they produce sloughing of the cervical mucous membrane and cause the development of atresia.

Tampons.—Intra-uterine treatment should be supplemented by placing beneath the cervix a tampon, preferably saturated with a preparation of glycerin, a 50 per cent. solution of boroglycerid in glycerin, a 10 to 15 per cent. solution of ichthyol in glycerin, or a 25 per cent. ointment of ichthyol in lanolin. The following prescription is an excellent astringent and antiseptic:

℞. Pulv. alum., ... f℥j
Acid. carbolic., ... ℥vj
Glycerin., ... Oj.

Various ointments, either astringent or alterative, with lanolin as a base, may be used upon the tampon. A tampon improves the circulation by raising the uterus to a higher level and maintaining it there. The antiseptic tampon may be retained from twenty-four to seventy-two hours according to its character. When the tampon is not used, or after its removal, a vaginal douche of two or three quarts of hot water (110° to 120° F.) should be used twice daily, with the patient in the recumbent position. When using very hot injections cover the vulva and perineum with vaselin, to prevent burning. The employment of rock salt, an ounce to the quart, in a douche, promotes its efficiency. Scarification under continuous irrigation will often prove of advantage, and is more effective than leeches. An iodoform gauze tampon should follow. Intra-uterine injections have been employed for endometritis, but should never be used unless the canal is sufficiently patulous to permit the escape of the superfluous fluid. The preferable plan is to employ a pipet or syringe by which one, two, or three drops may be introduced. Occasionally, even this small quantity will cause violent uterine colic. These attacks are not necessarily dangerous, but they are not calculated to encourage the continuation of treatment.

The treatment *par excellence* in chronic endometritis is the use of the curet. In senile endometritis the important consideration is drainage; to insure this, it may sometimes

be necessary to employ a tube. The cavity should be frequently irrigated with an antiseptic solution.

377. Chronic Metritis.—Chronic metritis is an inflammation in the muscle-wall of the uterus, leading, when long continued, to increased connective tissue formation. The term metritis is used in a comprehensive sense, and comprises conditions which have been described by different writers under such terms as chronic parenchymatous inflammation (Scanzoni); subinvolution (Simpson); diffuse proliferation of connective tissue (Klob); infarction (Kiwisch); hyperplasia of fibromuscular tissue, similar to fibroid tumors (Virchow); diffuse interstitial metritis (Noeggerath); irritable uterus (Gooch). The term may be criticized from a pathologic standpoint, as there is no chronic inflammation of the muscle-fiber of the uterus, but an increased amount of connective tissue, out of proportion to that of the muscle-fiber. Clinically it is satisfactory, as it enables us to comprise under one term a variety of conditions which may be developed from different causes but produce a similar group of symptoms. It has been objected to this term that, by inference, there has been a profuse acute inflammation, which is not the case, as chronic inflammation of the uterus does not follow the acute. It is more correctly described as an increased tissue formation, dependent on long-continued congestion. The term chronic is applied to analogous forms of inflammation in other organs and structures of the body, as cirrhosis of the liver, which describes a condition similar to that which is found in the uterus. Subinvolution is, in some English books, described separately, though it is due to the same cause.

The differential diagnosis between subinvolution and chronic metritis is impossible, and the treatment of the two conditions does not differ. The altered condition of the uterus will vary with the period at which the patient comes under observation. In the early stages the organ is enlarged, hyperemic, and soft. Later, it may decrease in size, though it is still large, and then becomes hard, indurated, and anemic. The enlargement of the organ is uniform, so the shape is not altered. Upon opening the abdomen of such a patient, the peritoneal surface will present a normal color, or patches of extravasated blood may be present. On section, in the early stages the tissues will be soft, hyperemic, easily incised; later, firm, cartilaginous, presenting a whitish color, the walls thickened, and the cavity of the uterus enlarged. Not infrequently the organ will be found as firm and dense as a mature fibroid growth. During the first period, De Sinety says, the dominant lesion is the presence of a large number of embryonic elements through-

out the thickness of the muscular wall. These are more particularly situated around the blood-vessels, or they may form islands more or less separated from one another. The second period is characterized by two changes: first, marked dilatation of the lymphatic spaces; second, localized hyperplasia around the blood-vessels. We may find it difficult to determine whether the muscular tissue remains normal, or is present in decreased quantity. Fritsch examined uteri removed for cancer, and found associated evidences of chronic metritis, in which the following pathologic changes were noticed: The arrangement of the muscular fiber and connective tissue is less regular than in the normal, and the latter is greatly increased in quantity. Blood-vessels are more numerous and tortuous. The vessel lumen is contracted, its tunica media is thickened, and the contour of the vessel is masked by the degeneration of the connective tissue in its wall. The lymphatic spaces, instead of being narrow clefts, are gaping; the peritoneum is thickened. Both Corneuil and Snow-Beck described an increased number of round and oval globules with amorphous tissue in the uterine walls. The increase in the size of the organ is due to the presence of this rather than to the increase of muscle-fiber.

378. Etiology.—The causes of chronic metritis are divided into two classes: the predisposing and the exciting. The former may be divided into: (*a*) Those which operate by interference with the normal involution of the puerperal uterus; (*b*) those which are due to the production of repeated or protracted congestion. The first class comprises: first, retentions within the uterus of portions of placenta, membranes, or blood-clots; second, cervical lacerations; third, pelvic inflammations subsequent to labor; fourth, too short convalescence following delivery; fifth, nonlactation; sixth, repeated miscarriages. Two factors are essential to the accomplishment of involution: first, fatty degeneration of the muscle-fiber; second, removal of the products of degeneration. Now, subinvolution or failure of the uterus to undergo complete involution is due not to want of degeneration of muscle-fiber, but to substitution of connective tissue for the products of this degeneration. Metritis, then, is generally found in women who have borne children, and it has been asserted that involution is retarded by the removal of the ovaries, although a patient of mine who completed her gestation after the removal of both ovaries did not manifest any failure in the process of involution. Any irritation in or about the uterus will cause a chronic metritis, and this explains the effect of retention of portions of the placenta or membranes, of lacerations of the cervix, and of the existence of peritonitis or cellulitis, as these conditions interfere with

the circulation, which is also affected by premature getting up following labor. The organ is heavy, and the increased weight leads to its being displaced to a lower level, producing passive congestion. Passive congestion is decreased by any cause which increases uterine contractions; the physiologic stimulus of nursing excites contraction reflexly through the mammæ and favors involution. Abortions are especially instrumental, for the reason that the patients do not take so much care of themselves as they would subsequent to a labor, and the stimulus of lactation is absent. After an abortion conception is likely to occur before the process of involution is complete, and this favors the recurrence of abortion.

The second class of cases, which operate through production of repeated or protracted congestion, includes displacements of the uterus, the presence of tumors in or near it, and causes that produce increased flow of blood to the uterus, such as endometritis and the free use of caustics. To this class also belong malformation, incomplete development, congenital anteflexion, conic cervix, stenosis of os, improper clothing, exposure to cold, and masturbation. Metritis is favored at each menstrual period, by exposure to cold, especially when the uterus is displaced or the cervix is contracted or lacerated, by excessive copulation or its practice during menstruation, and by gonorrheal infection from an incompletely cured husband.

Chronic contusions from the use of a pessary may engender the inflammation. The intra-uterine stem-pessary is capable of doing the most injury.

379. Symptoms.—In the large majority of cases the patient will date her trouble from a confinement. Not infrequently she will report repeated abortions, and that she subsequently regained her health very slowly.

The symptoms are not characteristic, but are similar to those found in cancer, fibroma, displacements, and other local disorders. They are: weakness; pain or aching over the lower lumbar and sacral regions; a sensation of weight and bearing down, as if the pelvic organs were to be extruded; an apparent loss of power in the limbs; points of anesthesia over the anterior surface of one or both thighs; painful contractions of the uterus; irritable bladder; constipation; loss of all pleasurable sensation during the sexual relation; pricking pain in the eyes and weak sight; photophobia; occipital pain, but more frequently pain over the coronal suture; and disturbances of menstruation, as dysmenorrhea, abnormal bleeding, menorrhagia, or metrorrhagia. In weak patients are found amenorrhea, leukorrhea, hydrorrhea, hydrorrhœa gravidarum, puerperal hydrorrhea associated with retention of portions of placenta

and clots. Not infrequently there is loss of appetite, nausea, dyspepsia, and enfeebled assimilation. The patient is pale, anemic, and exceedingly weak, with dark circles beneath her eyes. She suffers from palpitation and a sense of oppression, and is exceedingly despondent, and profoundly melancholic. Acute mania, epilepsy, hysteria, and neurasthenia are occasionally induced, and are always aggravated by the existence of chronic metritis. The diseased condition under discussion is responsible for the majority of cases of semi-invalidism. The patient is continuously conscious that she has a uterus; the distress is increased by exercise and lessened by rest. The constipation and digestive disturbances are aggravated and increased by dread of pain and by her sedentary habits. The patient can suffer from acute exacerbations, with diarrhea and rectal tenesmus, as a result of extension of the inflammation to the rectum.

Menstrual disturbances are common, largely induced by the accompanying endometritis, called, from the bleeding, hemorrhagic endometritis.

The hemorrhage is probably quite as often due to the diminished contractile power of the organ, from the substitution of connective tissue for the muscle-fiber. The associated disease of the mucous membrane adds to the dysmenorrhea, which may precede, be simultaneous with, or follow the period. It is generally continuous with the period, in the form of increased backache, pressure, and pelvic discomfort.

Leukorrhea is produced by alterations of the uterine mucous membrane. In the aged not infrequently a hydrorrhea develops, with a periodic discharge so offensive as to lead to the suspicion of the development of malignant disease.

Sterility is a natural consequence of the prolonged existence of chronic inflammation, not only from alterations in the structure of the wall and mucosa, but probably much more from the superadded changes in the pelvic peritoneum, affecting the tube and ovaries. The escape of the ovum may be prevented by extensive adhesions fixing the ovary, or through thickening of the ovarian tunica albuginea, which prevents its exit from the maturing Graafian follicle. The Fallopian tube may furnish the obstacle, through closure of its abdominal or uterine end, or by stricture along its course.

In the earlier stages of the inflammation the susceptibility to pregnancy may be engendered by the conditions, while the existing changes unfit the internal uterine surface for the complete nutrition of the developing embryo, and abortion or premature discharge of the contents follows The substitution of connective for the muscular tissue, through the

consequent uterine inertia, when gestation is completed, renders delivery tedious and increases the danger of postpartum bleeding.

Chronic metritis is responsible for a large proportion of the sofa and bath-chair population—the nervous, debilitated, dyspeptic women who wander from physician to physician or crowd the watering-places during the summer. The condition is frequently unrecognized and untreated, and the patient is condemned to suffer deeper and deeper wretchedness.

380. Physical Signs and Diagnosis.—The uterus is large, without a change in shape. The walls are firm and rigid, in later stages almost as resistant as a fibroid tumor.

The organ may have a normal position, may be situated at a lower level, or may be displaced. It may be freely movable or more or less fixed; readily outlined or fixed in a mass of pelvic exudate. The organ is sensitive to pressure.

Differential Diagnosis.—Pregnancy in the early stages presents a history of cessation of menstruation and of increased discharge. The uterus is enlarged, the cervix soft, while the body bulges like a jug, and is not resistant. Cancer usually involves the cervix, though the body may be the site of origin. In the latter the bimanual examination will show points of increased resistance. Bleeding results from severe manipulation, and an offensive, thin, and serous discharge will probably be present. Pain is a frequent symptom, and occurs most severely toward evening. The use of the curet or digital exploration after dilatation with tents may be required to insure the diagnosis. The cureted tissue in cancer will be friable from infiltration, exhibiting under the microscope the characteristic cellular structure.

Small fibroids are frequently difficult to recognize, especially when interstitial or submucous. The irregular enlargement, well-defined points of resistance, and frequently intermittent pain are diagnostic. Digital exploration of the uterine cavity determines the presence, size, and situation of the growth. Salpingitis is often associated with metritis, when it may be difficult to determine which predominates. A small ovarian tumor may be the cause of hemorrhage.

Rectal disease may produce symptoms simulating chronic metritis. The general health may be so affected as to cause the local manifestations to be overlooked. Thus, the patient may complain of persistent cough, difficult breathing, or progressive emaciation, or the stomach may be the source of trouble, causing loss of appetite, flatulence, and gurgling, and presenting evidences of dilatation. She may have precordial anxiety palpitation, or cardiac and vascular murmurs.

It is a good rule to make a careful uterine examination in all cases of chronic disease.

381. Course and Prognosis.—Metritis in all forms is obstinate and rebellious. The mucous membrane, muscular wall, and serous covering in turn are affected, followed by uterine sclerosis, cyst formation, and, finally, chronic metritis. In alterations of structure we can not hope to cure in the sense of restoration of altered tissues; we can hope only for arrest of the process, relief of congestion, and amelioration of unpleasant symptoms.

382. Treatment.—The best treatment is preventive. It consists in thoroughly emptying the cavity of the uterus after labor; in early repair of lacerations; in the relief of inflammatory conditions existing about the uterus; in stimulating involution of the organ by hot vaginal douches; in the administration of ergot and of remedies that will facilitate the contraction of its muscle-fibers; in the exercise of such measures as will diminish congestion; in preventing the patient from rising too early from bed after pregnancy or abortion, and, when the condition subsequently exists, obliging her to remain in bed several hours daily, and to avoid sedentary occupations and long standing. While it is important that the patient should have sufficient rest, it is equally desirable that this should not be excessive. A certain amount of exercise in the open air is as desirable as rest. Tight clothing should be excluded. If the abdominal muscles, however, are very much relaxed, a snugly fitting abdominal binder affords great comfort and relief. This relaxation of the abdominal muscles is not infrequently associated with relaxation of the vaginal walls, when the use of a ring-pessary gives comfort. The circulation of the pelvis should be stimulated by vaginal douches of either hot or cold water. The latter are more stimulating, but few patients can employ them. Patients should take a hot douche containing rock salt, at a temperature of from 103° F. to 120° F., for ten or fifteen minutes before retiring. These douches are more effective when the patient is in the recumbent position. She can lie across the bed with her pelvis upon a basin or rubber pad, which should drain into a pail below, while her feet rest upon chairs. A douche bag, containing at least three pints, should be placed three feet above the level of the patient. Prior to its use the vulva and perineum should be coated with vaselin, to protect from the heat. The tube should be introduced to the cervix, and from three to ten pints of fluid should be used with each douche. Occasionally, warm baths should be used simultaneously with the vaginal douche. A cold hip-bath in the morning will be of

great service. Medicated baths and waters are often of value. A course in hydrotherapy will frequently be serviceable. In catarrh or in scrofulous and chlorotic patients iron waters are beneficial. In nervous patients the character of the water is unimportant, but the patient should be encouraged to take large quantities. With dyspeptics, alkaline waters are desirable. In the lymphatic and scrofulous cases waters impregnated with chlorid of sodium are very efficient. These are also of value in some forms of chronic metritis where engorgement of the uterine body predominates. Patients not infrequently derive great advantage from change of air or scene, new surroundings, new relations, or a visit to the seashore or country. Constipation should be combated, preferably with foods, such as vegetables, Graham bread, and prunes; often effectively with other agents, as a teaspoonful of white mustard in water at meals; enemata to which glycerin is added; the administration of mineral waters—the Friedrichshall water, Carlsbad salts, or Hunyadi Janos. The Carlsbad salts are of particular value in bilious patients. A teaspoonful should be dissolved in a glass of water and drunk in repeated sips during the morning. Friedrichshall and Hunyadi act best when mixed with equal quantities of hot water. A good mixture is a tablespoonful of the following preparation:

℞. Magnesia sulph., ... ℥vj
Quinia sulph., ... gr. xxiv
Acid. sulphuric. dilut.,
Tr. capsicum, ... āā f℥j
Aquam, ... ad f℥vj. M.
Sig.—Tablespoonful three times daily.

Contraction of the uterine muscles may be increased by the administration of ergot, which should be given in doses of gtt. xx to f℥j, t. d. When the condition is complicated with menorrhagia, extract of hydrastis canadensis may be combined. An effective prescription would be a mixture of ergot and hamamelis. (Section 156.) Potash salts are especially beneficial in chronic inflammation of the uterus. Chlorate of potash is highly recommended by Tait. Iodid of potash, however, is equally effective, and, when the patient is nervous and restless, may be combined with a bromid, giving of the iodid gr. v, with bromid gr. x, largely diluted with water, three times daily. Potash salts may be administered in the bitter tonics, as in compound tincture of cinchona or compound tincture of gentian. In the anemic and debilitated, iron, strychnin, quinin, arsenic, cod-liver oil, and malt extracts will prove beneficial. The general health should be carefully watched and any deranged condition of the various organs

should be corrected. During the menstrual period patients should be confined to the sofa. When the pelvic distress is marked, or when the metritis is complicated by inflammation in the surrounding structures, benefit will be derived from the use of counterirritants, in the form of small blisters over the inguinal region, or the use of iodin or of croton oil. A good mixture is croton oil, one part; tincture of iodin, two parts; sulphuric ether, five parts, which can be painted over the hypogastric and iliac regions until a crop of pustules arises. The application should then be discontinued until they have healed. Exercise care not to allow the application to be made in the groin. Blistering fluid may be applied to the cervix and to the vault of the vagina, or tincture of iodin, or a combination of tincture of iodin and glycerin, may be thus used. Scanzoni advocated this application:

℞. Potas. iodid., ... gr. iv
Glycerin., ... ♏xxx.

When cervical catarrh complicates the condition, puncturing or scarifying the cervix, under an antiseptic stream, will be beneficial. Considerable depletion can thus be effected and the patients relieved. After the bleeding has stopped, a tampon of cotton and gauze, associated with one of the preparations of glycerin, will prolong the depletion. A tampon raises the uterus to a higher level and improves its circulation, while, medicated with glycerin, it has a depletive or cholagog effect upon the vessels of the cervix, causing a profuse watery discharge. The patient may be instructed how to introduce these tampons, and may use them daily. A tampon saturated with a 50 per cent. solution of boroglycerid in glycerin, a 10 to 20 per cent. solution of ichthyol in glycerin, or carbolic acid (1 : 16) may be kept in place for one to two days. A tampon anointed with one part of ichthyol to four of lanolin is valuable when more or less irritation of the vagina is associated with the uterine lesion. In laceration of the cervix, where it has subsequently become hypertrophied, Emmet's operation is of service in relieving the congestion and promoting involution of the organ. If the cervical mucous membrane is much everted, with papillary projections and eroded surfaces, amputation of the cervix by the single-flap method advocated by Schröder (Section 268) will be more effective. Any disturbances of menstruation, such as dysmenorrhea and menorrhagia, should receive treatment suitable for endometritis. (Section 365.) For this condition, as well as for the chronic metritis, dilatation and curetage of the uterus are of value. The dilatation is preferably done with Pratt's dilators, as these instruments gradually stretch the uterine canal without danger of tearing, unless

the dilatation is excessive, which may occur in the use of the parallel bar dilators.

After preparation of the patient (Section 118) she is placed upon her back, the uterus is exposed by the Edebohls speculum, the cervix is seized and fixed with a double tenaculum, and the bougies are introduced, thus gradually dilating the cervical canal. The dilatation is followed by the use of the curet. This instrument may be blunt or sharp; the latter is preferable, if carefully used. The handle of the instrument should be perforated, so that the surfaces can be irrigated as the cureting is done. The instrument is held lightly, between the thumb and finger, and is passed into the uterus and drawn down on all sides of the organ in long sweeps, paying particular attention

Fig. 290.—Uterus Dilated with Graduated Bougies.

to the angles of the body and to the orifices of the Fallopian tubes. The use of the curet in this manner does not remove the entire mucous membrane; even though it did, the mucous membrane would be regenerated from the portion of the glandular structure which penetrates the muscular wall. The curetage may be followed by swabbing out the cavity of the uterus with tincture of iodin, with a combination of tincture of iodin and carbolic acid, perchlorid of iron, or preferably a saturated solution of iodoform in ether. When any of these agents, except the latter, are used, the irrigator should be introduced, again washing out the cavity of the organ, thus removing any clots and superfluous medicine. If the discharge of blood is slight, the uterine cavity need not be packed. If

there is considerable discharge, it should preferably be packed with iodoform gauze. Gauze packing is serviceable in that it first acts as a tampon, decreasing the danger of bleeding or of the formation of a clot of blood, which might become infected and give rise to extension of inflammation to surrounding structures. Second, by its pressure upon the surface it favors the throwing-out of exudation and shuts off the entrance of septic material into the uterine sinuses; third, by its capillary action it affords a limited amount of drainage; fourth, by its presence as a foreign body it stimulates uterine contraction and facilitates the process of involution. The vagina is carefully cleansed and a gauze pad is placed within

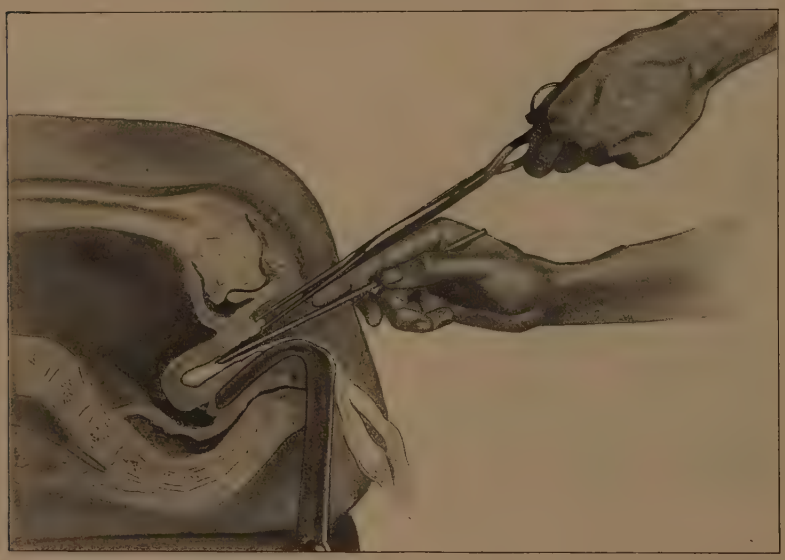


Fig. 291.—Uterine Cavity Packed with Gauze after Dilatation.

it, thus raising up the uterus. This gauze dressing may be permitted to remain two or three days. After its removal the vagina should be irrigated once or twice daily with a bichlorid or formalin solution. When the uterine cavity has been the seat of extensive inflammation, with a predisposition to hemorrhage, the removal of the gauze may be subsequently followed by uterine irrigation through a double-current catheter. In hydrorrhea or pyometra in the aged it is very important to make sure that drainage is complete. The accumulation of fluid within the uterine cavity results in the formation of a sac of this organ, the contents of which may become infected

and produce an occasional profuse discharge, which may cause the greatest alarm on the part of the patient. Drainage in such cases should be insured; when necessary, by the introduction of a drainage-tube, through which the cavity is well irrigated and cleansed. Remedies should be applied to the uterine cavity which will establish a healthy inflammation and arrest the abnormal accumulation. When the uterus is displaced, associated with hydrometra or pyometra which a pessary fails to correct, the advisability of extirpation of the uterus should be considered, particularly if the woman has passed the climacteric. Uterine adhesions or peri-uterine inflammation need not necessarily contraindicate curetage, as not infrequently the increased drainage thus secured will result in the relief of the peri-uterine disease. In patients who have suffered for a great length of time, who have become exceedingly nervous, hysteric, with general health destroyed, suffering from delusions or illusions, exceedingly irritable temper, a source of worry and distress to the family and to themselves, no better plan of treatment can be instituted than that advocated by Weir Mitchell as proper for neurasthenic patients. This treatment consists in placing the patient in bed; at first upon a distinct milk diet, with careful regulation of the bowels, correction of disordered condition of the alimentary canal; and, later, forced feeding, with as large a quantity of food as the patient can properly digest. She is under the control of a discreet, careful nurse, who allows her to take no exercise nor even to move without assistance. In place of exercise she is given, once daily, thorough massage, thus carrying forward the blood-current, stimulating the absorption of waste material, and causing the introduction into the uttermost parts of the body of blood containing oxygen. The anemia which characterizes such patients is thus rapidly overcome, the number of red blood-corpuscles greatly increases, while the elimination of waste material is promoted. Once a day she is given an application of the faradic current—general faradization. She is isolated from the members of her family, and during this period of isolation is brought under careful mental discipline, which aims to stimulate her ambition, to overcome the condition by which she has become subjected, so that by the end of six weeks or two months the patient undergoes a complete physical and mental change.

383. Inflammation of the Fallopian Tube.—Inflammation of the tubes is a frequent result of infection, and the gravity of the physical changes is directly in proportion to the virulence of the poison. Gonorrhea and sepsis are the most frequent forms of infection which invade these organs. The

invasion may occur through the uterus by the continuous mucous membrane, or through the blood-vessels or lymphatics; the former being the more frequent. The inflammation may involve the mucous membrane, the muscular wall, and even the peritoneum. It may be catarrhal or suppurative. Gonorrheal infection most frequently reaches the tube by the continuous mucous membrane of the uterine body, and is more prone to involve the tubal mucosa, resulting in either catarrhal or suppurative salpingitis. It may, however, pass rapidly through the surface epithelium into the deeper structures of the tube, and causes profound destruction. Other avenues

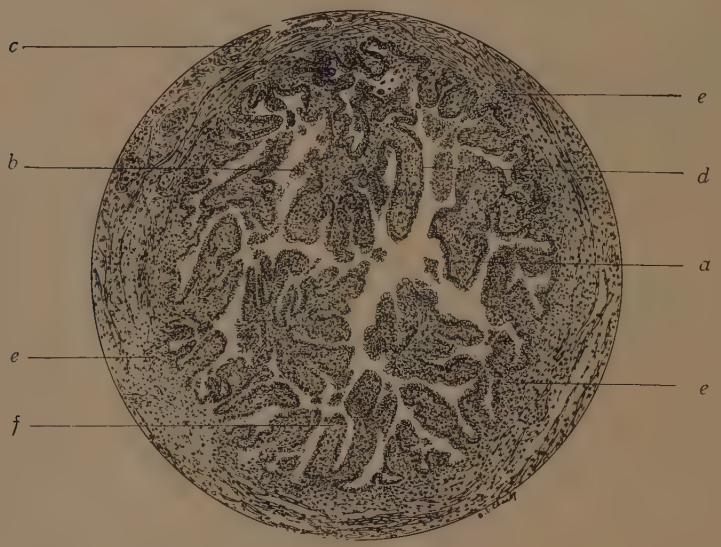


Fig. 292.—Acute Salpingitis.

a, Swollen and edematous fold. *b*, Inflammatory exudate. *c*, Dilated blood-vessel. *d*, Desquamation of epithelium. *e*, Infiltration of leukocytes. *f*, Disintegration of longitudinal fold.

for the entrance of infection are an inflamed or diseased appendix, especially upon the right side, through adhesions to a knuckle of intestine, especially where the tube contains a collection of blood, and, finally, through the peritoneum, which, however, is generally tubercular. The entrance of infection is followed sooner or later by evidences of inflammation. The epithelium becomes swollen, edematous, and granular, with the infiltration of inflammatory materials into the deeper layers. Serous effusion takes place into the tubal canal. (Fig. 292.) Loss of the cilia from the epithelium also occurs, especially

upon the free surface, while they may be retained upon that portion between the folds. The epithelium will be found well preserved upon the surface of the tubal mucous membrane even when suppurative processes exist. (Fig. 293.) The irritating discharge from the tube early leads to irritation of the peritoneum and agglutination at the abdominal end of the tube, while the swollen structures obstruct the uterine orifice. The exudate which collects in the tube may be serous or purulent, according to the virulency of the infection and the resistive force of the patient. In either case the exudation is likely to increase, forming a clear serous collection in the

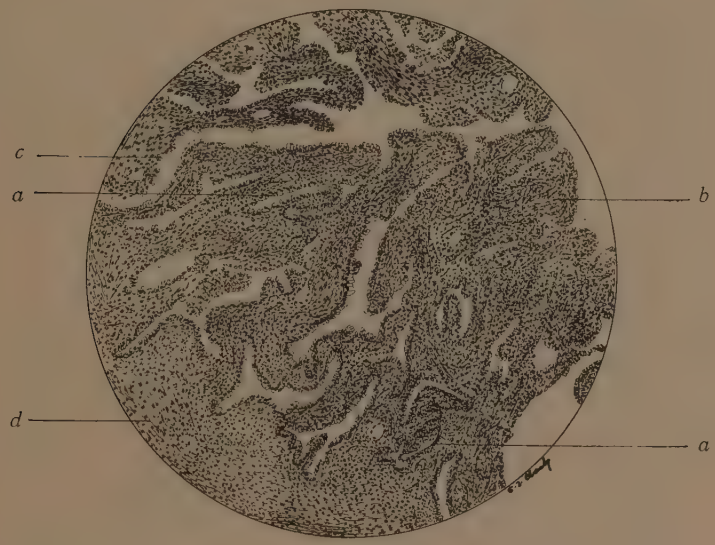


Fig. 293.—Chronic Salpingitis showing Agglutination of Folds.
a, Union of folds forming gland-like areas. *b*, Thickened and retracted fold. *c*, Desquamation of epithelium. *d*, Hyperplasia of tubal wall.

one case, which is known as hydrosalpinx, or sactosalpinx, while the more virulent process (Fig. 294), which results in a more or less extensive pus collection, is called a pyosalpinx. (Fig. 295.) Occasionally the excessive hyperemia or a partial twisting of the base may cause rupture of the blood-vessels with an intratubular accumulation of blood. This condition is denominated hematosalpinx. The latter condition, however, is more frequently associated with the retrogressive processes of ectopic gestation. As a result of the inflammatory process the tube may assume the form of a simple sac, which gradually becomes distended until it attains a large size, and

presents as a thin-walled cystic tumor. If the peritoneal wall has not been involved, the tumor may remain freely movable, whether it contain serum or pus. Such a sac may, occasionally, become twisted upon itself until the venous circulation is partially or completely obstructed, and then rapid increase in size results from the hemorrhage, which takes place not only into the sac, but also, occasionally, into the peritoneal cavity. A young girl recently came under my observation in whom there had been an apparent acute exacerbation. Examination revealed a large mass upon either side, that on the left side being situated above the uterus, and that on the right posterior to and below the fundus. An operation was advised

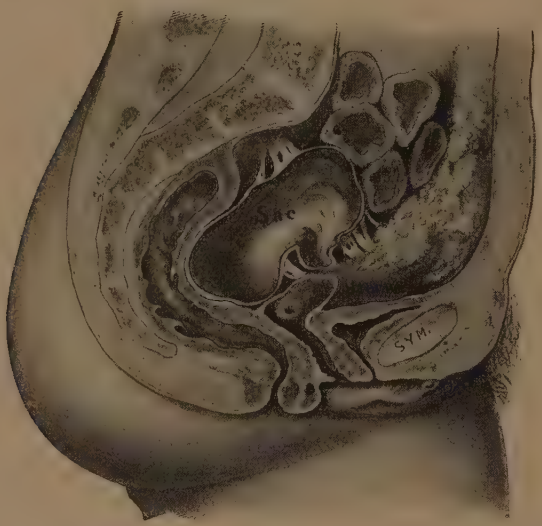


Fig. 294.—Extensive Pus Collections with General Adhesions.

and subsequently performed. This revealed so much blood as soon as the abdomen was opened as to arouse the suspicion of an ectopic gestation. The hemorrhage in this patient came from the tumor of the left tube, the neck of which was twisted near the uterus. The tubal sac was dark (Fig. 298), and covered with clotted blood, which also filled that side of the pelvis. The right sac was clear and free from blood. Both sacs were found to contain pus, the left being mixed with blood. Both tubes were free from adhesions. Sometimes the distention of the tubal sac overcomes the swelling of the mucous membrane of the uterine end and, therefore, its opening remains patulous and permits its contents to escape, after which the sac attains

a favorable position. Such a condition may lead to occasional discharges of a considerable quantity of fluid through the uterus, giving rise to the phenomenon known as hydrops tubæ profluens, or intermittent hydrosalpinx. Inflammation of the tube involving its muscular wall causes a shortening of its longitudinal muscular fibers, which, owing to the contractile action of the subserosa, permits the fimbria to be drawn into the tube and the peritoneum to be pushed over it like the prepuce over the glans penis in phimosis. (Fig. 299.) The peritoneal edges coming in contact are agglutinated, and the tube is sealed up. If the fimbriæ are not completely withdrawn, the protruding fimbriæ may serve as an avenue for leakage in subsequent distention of the sac and thus cause recurring attacks of localized peritonitis. (Fig. 300.)

Fig. 295.—Pyosalpinx.

The tubal inflammation, instead of forming the cystic tumor already described, may result in extensive small-cell infiltration and thickening of the longitudinal folds, which necessarily decreases the caliber of the tube. Furthermore, in places the edges of the folds lose their epithelium, become more or less adherent, and upon microscopic section present the appearance of distended glands. Such a condition has been called salpingitis cysto-adenosa, but this term, like salpingitis follicularis, pachysalpingitis, and other designations, is an unnecessary distinction. The inflammatory infiltration frequently involves the folds and wall of the tube, producing such hyperplasia of these structures as to almost obliterate the tubal canal, and to form a large sclerosed mass. The contraction of the circular fibers may cause the formation of a series of small sacs, each one of which is independent of the other, and

for which the only relief is afforded by the extirpation of the tube. In the more virulent forms of infection the peritoneal surface of the tube becomes involved by an extension through its abdominal end or through its walls, and extensive adhesions unite the organ to coils of the intestine, the uterus, the ovary, or the pelvic peritoneum. The enlarged and swollen tube drops down into the retrouterine culdesac, and generally becomes ad-

Fig. 296.—Section from Wall of Pus-tube.

a, *a*, *a*. Folds matted together forming gland-like spaces. *b*, *b*. Folds undergoing dissolution. *c*. Shows complete desquamation of epithelium covering folds. *d*, *d*. Blood-vessels distended with blood-cells. *e*. Leukocytic infiltration.

Fig. 297.—Single Fold from Wall of Pus-tube, enlarged. Line through upper portion shows area of extensive hyperemia.

herent to the sigmoid flexure or side of the rectum. As the sac becomes more and more distended, the union thus formed may permit the establishment of a communication with

the lumen of the bowel, through which the tubal abscess drains. The tube of one side, dropping into the pelvis, may become adherent to the extremity of the other and form a common pus cavity, which may attain a large size. (Fig. 301.) By a rupture of the tube, infection of Douglas' pouch may occur, thus filling the entire pelvis with a walled-off abscess. The intimate association of the abdominal orifice of the tube with the ovary causes frequent adhesions between these organs, resulting in intimate fusion of the involved structures, and rendering it sometimes difficult to differentiate between the two organs. Occasionally they appear as a tubo-ovarian tumor or a fused inflammatory mass, which may contain serous fluid or pus.

Fig. 298.—Distended Pus Tubes Removed from Young Girl.

A, Tube whose pedicle was twisted. Sac filled with blood and pus. *B*. Right tube filled with pus.

384. Symptoms.—Tubal inflammation has no characteristic symptoms. If a patient has had an acute pelvic inflammation, characterized by extreme tenderness in either pelvic region, and aggravated by motion, it is justifiable to conclude that the possible pelvic peritonitis has had its origin in a tubal inflammation. When each menstrual period is followed by pain and tenderness in the inguinal regions, tubal inflammation is very probable. A normal tube is not usually palpable. In diseased conditions, however, especially when the tube has become thickened by salpingitis or parenchymatous inflammation, it may be recognized as a more or less thickened cord which slips under the finger and is quite sensitive. When

hyperplasia of its connective tissue occurs, the tube is felt as a contracted, distorted, nodular mass, closely associated with the uterus and frequently firmly fixed in the pelvis. When the abdominal end is closed, it may present an enlargement increasing from the uterus outward, something like a bell-retort, or gourd, in shape, or resembling a sweet potato or sausage or sausage-like links.

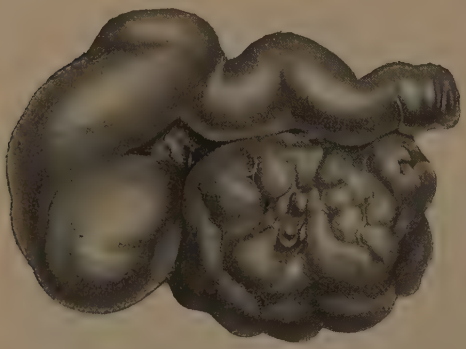


Fig. 299.—Convoluted Fallopian Tube from Perisalpingitis.

385. Diagnosis.—When the uterus is bound down with evidence of extensive peritoneal inflammation upon the sides, in the majority of cases the tubes will be found to have been the source of infection. In a normal condition, unless the patient is very thin, the tubes are not palpable. Inflammatory change, however, which renders the tubes resistant and causes them to be stiffened, leads to their recognition, so the determination of a cord-like structure running out from the side of the uterus is evidence of tubal inflammation. Where the tubes become occluded at their abdominal ends, and filled with secretion, they become more and more retort-shaped, being larger at the external portion and narrowing toward the uterus. A tumor presenting such a shape as this, and quite movable, is most frequently a hydrosalpinx. (Fig. 302.) It is true that pus tubes may at times be free from adhesions, but in the majority of cases the infection which is so virulent as to lead

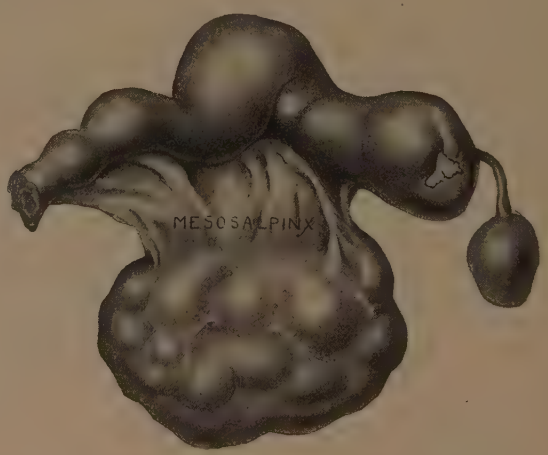


Fig. 300.—Incomplete Inflammatory Closure of the Fallopian Tube. Portions of Fimbriæ Unretracted.

to the formation of pus causes a perisalpingitis, which leads to agglutination of the surrounding structures, and not infrequently to absolute fixation of the pelvic structures. Where the tube is free from adhesions, it is likely to drop into Douglas' pouch. Here the change in the circulation not infrequently leads to it becoming adherent to the posterior surface of the uterus, the sides of the rectum, or the ovary and tube of the opposite side, forming a large mass filling up the pelvis. (Fig.

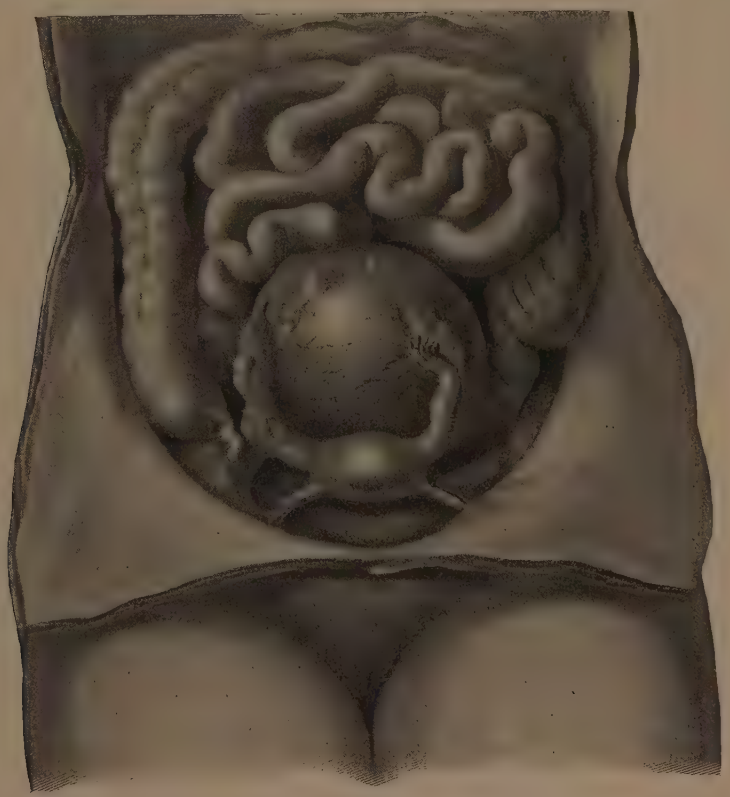


Fig. 301.—Double Tubo-ovarian Collection.

301.) These conditions are readily recognized by bimanual palpation. In practising this procedure, however, it is very important that it should be done with great precaution, remembering that not infrequently these sacs may be so thinned that undue pressure may lead to their rupture with the escape of their contents into the peritoneal cavity, causing a general infection, to be followed subsequently by peritonitis. The association of the ovary in a mass of this kind, forming a tubo-

ovarian abscess, is not always readily recognized. A tubo-ovarian cyst is more readily determined by the increase in size, by the greater spherical character of the external end of the sac, associated with a bell, or retort-like shape, as we approach the uterus.

386. Prognosis.—Tubal inflammation should always be considered a source of danger. Even its mildest forms should necessitate resort to treatment, in order, if possible, to arrest the progress and limit the extension of the inflammation. When associated with pelvic peritonitis, the extensive infection, especially the streptococcic form, is one of the most dangerous lesions with which we have to deal. When associated with disease of the ovaries and extensive suppuration of the tube, the cure of the patient, in the sense of restoration of her functions, is absolutely impossible. While the patient may recover her health and comfort, she is subsequently crippled for life, because her powers of procreation are destroyed.

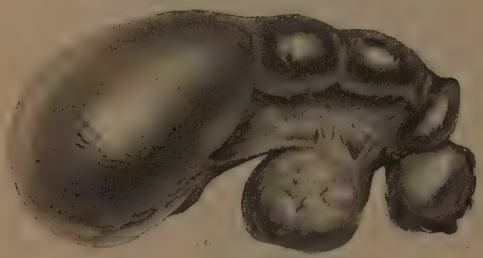


Fig. 302.—Hydrosalpinx.

Treatment.—(See Section 390.)

387. Inflammation of the Ovary.—Inflammation of the ovary occurs in two forms: oophoritis, inflammation of the structure of the organ; peri-oophoritis, where the inflammation is confined to its surface. A hyperemia or congestion of the ovary may arise as a result of infection. This may be so aggravated as to lead to rupture of vessels. The occurrence of hemorrhage into the structure of the ovary produces small collections of blood-clots in the organ, which is known as ovarian apoplexy, or a large collection of blood, when it is called an ovarian hematoma. The latter may destroy the ovary and even rupture its coat, and result in a serious internal hemorrhage. Oophoritis is an interstitial inflammation of the ovary, which may be either acute or chronic, septic or gonorrheal. It is characterized by all the signs of inflammation, hyperemia, swelling, increase in size of the vessels, extravasation of blood, and later pus formation. The latter may involve only a small portion of the ovary or the entire organ may become the seat of an abscess. The origin of the infection not infrequently arises in a corpus luteum, so we have what are known as corpus luteum abscesses. In these cases the walls of the abscess may be recognized by the wavy elevations of the inner wall on micro-

scopic section. The acute form of the disease is most frequently the result of infection; the latter gains admission through lesions of the vagina, of the uterus subsequent to labor or abortion, surgical operations, or an accidental injury. Infection may reach the ovary through the continuous mucous membrane of the tube or by way of the lymphatics or blood-vessels. In fatal cases the ovary will often be found very much enlarged, soft and sloughing, and containing small extravasations of blood

Fig. 303.—Double Pyosalpinx Showing Adhesions to the Rectum, to the Uterus, and, on the Right, to the Appendix.

or pus, or small collections of pus will be found in the connective tissue and structure of the ovary, or a single large abscess may exist, equal in size to a hen's egg or even larger. The larger abscesses may be produced by suppuration of an ovarian cyst. Suppurating ovaries generally become adherent to the neighboring structure, and, if the walls are thick, the pus may remain quiescent, thus being the cause of a chronic state of ill health. However, the pus may escape by rupturing into the bowel, bladder, or vagina. The cavity thus emptied may

shrink and ultimately disappear, while a state of chronic ill health will still continue. An inflamed or cystic ovary, adherent to the inflamed tube, frequently loses the intervening wall and forms a concavity, which is known as a tubo-ovarian cyst or tubo-ovarian abscess. Coalescence of both ovaries and tubes in such a sac may result in the formation of a tumor which fills up the pelvis. The formation of an abscess in the ovary is not always associated with peri-oophoritis. Some years ago I saw a patient in consultation, and subsequently operated upon her, in whom, some three weeks following her delivery, her temperature arose to 104° F. Careful examination failed to reveal any increase in the size of the uterus or anything to indicate that the uterus was the seat of disease. Some enlargement of the ovary upon the left side, which, however, was free from adhesions, led me to open the abdomen. After entering the abdominal cavity, the left ovary was found the size of a small orange; it was free from any adhesions, but had a small flake of lymph on one side, which corresponded to a similar flake in the orifice of the tube. The tube itself was not enlarged nor did it show any signs of an inflammatory condition. The ovary was afterward removed and, when opened, contained within a thin shell some thick, greenish pus. The subsequent convalescence of the patient was uninterrupted. In chronic oophoritis there is a great increase in the connective tissue, which results in contraction and thus causes destruction of the follicles and compression and arrest of development of the stroma, while the epithelium of the free surface is the longest preserved. This may present extensive fissures, the result of the contraction. In chronic inflammation the tunica albuginea becomes greatly thickened, so it does not readily rupture with the development of the Graafian follicle. The consequence is, that the follicle increases in size, and such an ovary may present a large number of cysts, producing the condition known as cystic degeneration of the ovary. Another form of chronic inflammation of the ovary has been denominated oophoritis serosa. In this form the inflammation is chronic in development and duration, and in the majority of cases it is curable, if properly treated. It may be a sequel of fevers, sometimes it is associated with mumps, and it may follow a passive gonorrheal infection. The ovaries become swollen, exceedingly tender, and frequently prolapsed. In advanced cases they are greatly swollen, quite smooth, shiny, and almost translucent. Folds and cicatrices are completely obliterated. Cirrhosis is a term which has been applied to various changes in the ovary. I have frequently seen ovaries which were pronounced cirrhotic, but which I could not regard otherwise

than as physiologic. The term is only applicable to those cases in which the ovary has undergone contraction to such a degree as to result in the destruction of its glandular tissue and decided decrease in size of the organs.

Peri-oophoritis is a condition characterized by the deposition of inflammatory material upon the surface of the ovary. The surface epithelium is destroyed and it is likely to be followed by a true oophoritis. This condition, like simple oophoritis, is frequently a part of a widely extended inflammatory process, which may involve uterus, oviducts, ovaries, pelvic peritoneum, and cellular tissue (Fig. 304). It is generally consequent upon an extension of infection from the tubal orifice to the pelvic peritoneum, although it may follow an abscess of the ovary.

Fig. 304.—Peri-oophoritis. Tube and Ovary Encysted.

The end of the tube is usually associated with the ovary in this form of inflammation, and it may be the forerunner of a tubo-ovarian abscess. The inflammation varies from a few bands of adhesions which bind down the ovary and tubal orifice, possibly occluding the latter, to a mass of exudation which completely obscures both and forms so intimate a fusion as to render difficult the line of demarcation between these organs.

The chief function of the ovary, apart from any supposed internal secretion, is to provide a site for the perfect development and maintenance of healthy ova, and to permit them, under circumstances as yet undetermined, to pass into the mouth of the oviduct. Peri-oophoritis necessarily interferes

with this process, by the presence of adhesions about the ovary, or the consequent induration of its tunic. An ovum escaping from a matured Graafian follicle will be barred from entrance into the oviduct, by adhesions which fix the fimbriated orifice or so envelop the ovary as to prevent it reaching the oviduct. Such adhesions are a cause of severe suffering, especially when they limit the free mobility of the ovary and fix it subject to pressure, as behind the uterus or over the rectum, or where intestinal adhesions subject it constantly to dragging and tension by intestinal peristalsis. An ovary fixed in the retro-uterine pouch, with an overlying retroverted uterus, is a constant source of distress. Its position, independent of the adhesions, causes congestion from the obstructed circulation, while the pressure of feces and the impinging male organ during coition promote the discomfort.

388. Symptoms.—Oophoritis exhibits no characteristic symptoms. Even in cases of acute septic poisoning no symptoms will be present which can be said to be absolute indications of an ovarian lesion. In the less severe form of inflammation we may recognize symptoms which we could justly attribute to ovarian disease, but they are so intimately associated with those caused by disease of the oviducts that it becomes difficult to differentiate them. Pain is the only constant symptom in all varieties of pelvic inflammation, and the site to which it is referred bears no constant relation to the affected organ. The entire pelvic region may be the seat of pain, but we are, however, unable definitely to distinguish the exact origin of pain and say whether it is due to affections of the tube, ovary, peritoneum, broad ligament, body of the uterus or cervix. We can readily appreciate this when we remember that the nervous distribution of the various organs is derived from a common symphathetic center. As in any inflammatory condition, pain is aggravated by pressure, so in inflammatory processes of the pelvic structures pain is magnified by pressure and motion. The pain is distinguished from that of true dysmenorrhea, by the fact that it is an exaggeration of the distress felt between the periods, while true dysmenorrhea is purely a menstrual pain. Not infrequently patients will assure us that the only time they are free from discomfort is during the menstrual flow. Pain may persist subsequent to coition as a result of congestive tension. When produced by intra-abdominal pressure and increased by standing, pain is greatly relieved by assuming the recumbent position. Ovarian pain is directly aggravated by pressure over the organs through the vagina or rectum, as during coitus, an examination, or the passage of large fecal masses. The various symptoms of pelvic disease,

such as amenorrhea, menorrhagia, or leukorrhea, are not characteristic of oophoritis. Peri-oophoritis causes pain which is more or less distinctly localized at the pelvic brim, and extends down the thigh of the affected side. Not infrequently pain is experienced in the corresponding breast. The inflammation may extend from the surface of the ovary into its substance and cause changes in its stroma, dropsy of its follicles or hemorrhage, producing a condition in the one case known as cystic degeneration of the ovary, and in the other as ovarian hematoma or ovarian apoplexy. The wide distribution of neurotic symptoms must not be overlooked. The local pelvic lesion may be a minor one. To oophoritis, or uterine displacement, are often attributed symptoms which are the result of fissures of the cervix, mobility of the kidney, enteroptosis, gastroptosis, or even central lesions of the nervous system, which will persist after the supposed local lesion has been cured or removed. Such experiences are a source of great disappointment to the medical practitioner. At times relief is obtained, at others pain and distress continue or are even aggravated.

389. Diagnosis.—Inflammatory processes of the ovary do not present a constant characteristic clinical picture. The infection rarely confines itself to the ovary, consequently the symptomatic phenomena are modified by the circumjacent inflammatory changes. The recognition of a tender body, somewhat enlarged, yet retaining the shape of the ovary, by vaginal or rectal palpation, adds certainty to the diagnosis. The presence of adhesions or exudate will render its determination difficult and make it doubtful how much the swelling is due to the ovary, the tube, or the exudate. In acute conditions or in hyperesthetic patients an anesthetic will prove of value. Where the obscurity of the condition can not be overcome a preliminary vaginal or abdominal incision may be necessary in order to determine the proper operative procedure.

390. Treatment of Inflammation of the Appendages.—In the great majority of chronic inflammations of the uterine appendages the treatment of diseased conditions of the tubes is similar to that of diseases of the ovaries, or, in other words, the two conditions are so related that I felt it better to consider their treatment under the one section. The first aim in the treatment should be the preservation of the function of the affected organs. The second, the restoration of health to the patient. Treatment may be either medical or surgical. The medical or nonoperative treatment consists in rest in bed and in keeping the patient absolutely quiet. Free purgation should be established by the use of salines in order to make the intestines drain the peritoneal cavity and relieve the congestion.

The diet should be restricted and cold should be applied to the external surface. In the acute stage the application of cold in the form of the ice-bag is of value, and this should be kept more or less continuously applied. The ice-bag decreases the congestion, limits the exudation, lessens the danger of suppuration, and promotes absorption. After the more acute symptoms have subsided the treatment may still further be promoted by the application of pressure, using three to five pounds of shot in a bag, which is applied over the inflamed, indurated tissues; the pressure is increased and its position changed, as the condition may demand. Unless suppuration has occurred, resolution will probably be accomplished. The absorption may be still further promoted by the use of counter-irritants, such as small blisters, painting with iodin, the use of croton oil or inunctions of dilute ointment of the iodid of mercury or a dram of the official ointment to an ounce of lanolin. Occasionally ice will be very uncomfortable to the patient, while heat will be more grateful. A flaxseed poultice may be applied, or, what is probably much more agreeable to the patient and more easily applied, would be to take a piece of spongiopilin, wring it out of hot water, and place it over the abdomen, and over this a dry cloth. This should be changed as frequently as may be necessary. The changing may be made less frequent, however, by the application over it of a hot-water bottle. Ichthyol in lanolin, one or two drams to the ounce, may be rubbed into the lower part of the abdomen, and this supplemented by the pressure already suggested. Hot vaginal douches should be employed, and benefit will frequently be obtained. by the use of hot rectal enemas, using a pint to a quart of hot water and directing the patient to retain it as long as possible. This is more effective than hot vaginal douches, for the reason that the heat comes more nearly in contact with the inflamed surfaces and can be retained for a greater length of time. Internal medication during this time, aside from the application mentioned, should be largely supporting. The patient should be carefully protected from any possibility of exposure or over-fatigue. During the menstrual period it is preferable that the patient should be confined to bed. The more acute stages having subsided, in addition to the douches and enemas recommended, the patient may take a hot sitz bath for fifteen to thirty minutes daily. With the further subsidence of the acute symptoms and in those cases in which it is evident that suppuration has not occurred, the adhesions binding down the ovaries and tubes may be overcome by the employment of pelvic massage. The structures are lifted up with one or two fingers within the vagina and manipulation over the abdomen employed, gradually pressing the fingers in so as to

follow lines of cleavage and to lengthen the bands of adhesions or promote their absorption by stretching and irritation. The congestion and pain in chronic inflammation of the ovary may frequently be very greatly lessened by the administration of fluid extract of gelsemium, giving five drops three times daily. In these conditions great prudence must be exercised in the administration of anodynes. A patient suffering from pelvic pain as a result of attacks of peritonitis, with binding down of the pelvic viscera, may very easily be led into the habit of taking morphin or opium until, instead of it simply being a servant, it attains the position of master, and the patient finds herself enslaved to a drug from which emancipation is very difficult. While it may be necessary, in an acute attack, to administer a dose of morphin, in order to allay the violent pain, yet, in the majority of cases, the early and continuous administration of salines, associated with the application of the ice-bag, will be effective in arresting the severe pain, or at least in making it endurable. The measures which we have already discussed are in the line of what we have denominated the first aim in the treatment of lesions of the uterine appendages—that is, to maintain the functions of these organs.

Surgical Treatment.—The surgical treatment does not necessarily discard the object which we have considered as the first aim in treatment, but may, indeed, assure its accomplishment, especially when early and efficiently established. Delay, however, would almost certainly favor the development of conditions which would necessitate more serious procedures. Operative treatment, with a view of maintenance or restoration of function, is known as conservative treatment. Where the sacrifice of the appendages is considered necessary, in order to save life or insure good health, the procedure is known as a radical one. Conservative treatment may consist in the breaking up of adhesions, the reopening of the orifice of the tube, salpingostomy, or the partial resection of the tube itself, thus shortening it and permitting the removal of those portions which are prejudicial to health. (Figs. 305 and 306.) This procedure also comprises the resection and removal of any diseased portion of the ovary, with the endeavor to retain a sufficient portion of the organ to insure the continuance of ovulation and menstruation. In chronic oophoritis with marked thickening of the tunica albuginea, and the development of small cysts in the ovary, a resection of the ovary or removal of the more diseased portion will frequently result in such metabolism as to restore the remaining portion of the ovary to a more normal condition. Wherever conditions will permit, a portion of the ovary should be retained; its retention will insure the continuation of menstruation and ovulation and

have a marked influence upon the general morale and nervous condition of the patient. The retention of the whole or a part of the ovary is desirable even though it may be necessary to remove both tubes, because it insures the continuation of ovulation and menstruation. This has a marked influence

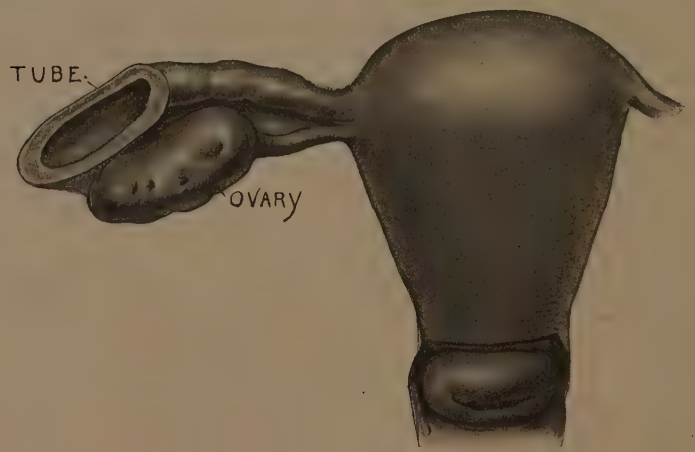


Fig. 305.—Resection of Tube.

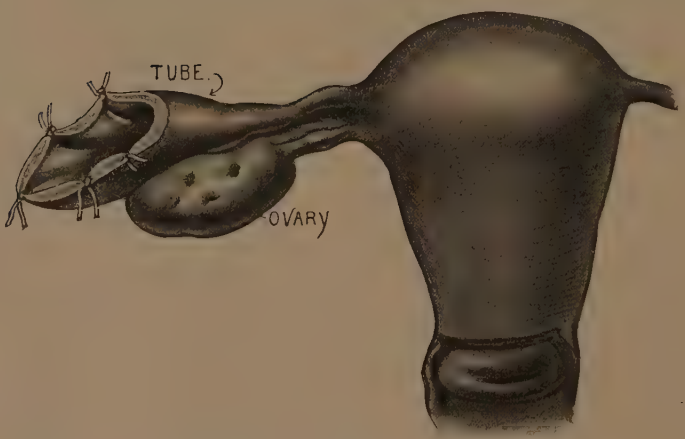


Fig. 306.—Operation of Resection of Tube Completed.

upon the nervous system of the patient. In surgical operations we are obliged to be governed by the physical condition of the organs under consideration. The abdomen should not be opened unless palpable disease of the uterine appendages by physical examination can be determined. Operations for pain in the region of the ovary, without ovarian enlargement, will most frequently be attended with no favorable result.

Where the disease is extensive and ovaries and tubes have undergone destruction, the removal of these organs will oftentimes be the only procedure that will afford any hope for restoration of the comfort and health of the patient. In suppurative conditions where the ovary is also involved in the inflammatory process, the better plan of procedure will be the removal of the ovary and tube complete. In a patient upon whom I recently had to operate the left ovary and tube were so extensively involved that their removal was indicated. The right tube was considerably enlarged, its wall was several times its ordinary thickness, and the cavity of the tube contained pus. In this case, the left tube and ovary having been removed, the right tube was dissected out from the cornua of the uterus and the opening in the broad ligament was closed with a continuous catgut suture, thus controlling hemorrhage. The ovary, as it presented no marked abnormal change, was permitted to remain. In these cases the operation is sometimes exceedingly difficult, as on opening the abdomen we will find the tube and ovary, with the fundus of the uterus, matted down in the pelvis in close association with coils of intestine, the omentum, and the parietal peritoneum. Where the condition is one of recent sepsis, it may sometimes be necessary to consider the advisability of removal of the uterus as well as of the appendages. When there is occasion to open the abdomen, the structure should be carefully inspected and examined by touch. The adhesions should be broken up and proper care be exercised to insure control of hemorrhage. In some patients, the broad ligament will be so contracted from the inflammatory changes that we will be unable to lift the ovary and tube out of the wound. In such cases the broad ligament should be resected with the ovary and tube. This may be accomplished without the application of ligature, seizing the bleeding vessels as we proceed, and holding them with hemostatic forceps, after which the wound in the broad ligament can be closed with a continuous catgut suture, so introduced that each turn or second turn shall lock the preceding stitch, and thus secure against hemorrhage and prevent the broad ligament from being distorted. After operations in some of these more critical cases, and sometimes prior to operation, the patient may be very greatly benefited by the employment of the rest treatment, the plan of treatment introduced by S. Weir Mitchell. It consists in the isolation of the patient, careful study of her condition, and the improvement of her general nutrition. The patient should be kept absolutely in bed; she should have her secretions corrected and her diet restricted, possibly at first to milk, and, later, feeding should be forced. Graduated exercise should be advised, supplemented

by the employment of massage and electricity. By these means the elements of the blood are restored and the patient gradually regains her strength and health.

391. Pelvic Inflammation.—The term pelvic inflammation is a comprehensive one. It is necessary, at the outset, to limit it to the conditions which we intend it shall include. Inflammation of the individual pelvic viscera has been discussed, so this term will be confined to inflammation which involves the cellular tissue and the peritoneum. It consequently includes those affections described as pelvic cellulitis and pelvic peritonitis.

These conditions have been designated as periuterine inflammation; by some writers of distinction, notably Virchow and Matthews-Duncan, the terms parametritis and perimetritis have been used—the former to indicate inflammation of the cellular tissue; the latter, of the peritoneum. These terms are objectionable for the following reasons: First, they are so nearly alike that it is difficult for the student to avoid confusion in their use, and the subject is rendered more difficult of comprehension. Second, a difference in the anatomic relations of the peritoneum and cellular tissue to the uterus is implied which does not exist. The pelvic connective tissue and the pelvic peritoneum are in equally close contact with the uterus. It is distinctly objectionable, therefore, to consider one as an inflammation about the uterus and the other as an inflammation near it. Third, the conditions are described as associated with the uterus, while they may exist in all the tissues of the pelvis, and are not necessarily uterine in their origin.

Careful investigation of the pathology of these conditions by autopsy, and their more extended study during abdominal procedures while in active stages of disease, have demonstrated how easily such erroneous views could arise.

Bernutz and Aran, of France, many years ago demonstrated the true nature of pelvic inflammation, which has been abundantly confirmed in the practice of abdominal surgery, where the opportunity has been afforded for comparing physical signs with the actual existing pathologic changes.

392. Varieties.—Pelvic inflammation as we have described it is properly divided into inflammation of the cellular tissue (pelvic cellulitis) and inflammation of the peritoneum (pelvic peritonitis). It must not be understood in these definitions that the demarcation between these affections is sharply defined, for, in practice, we do not find inflammation confined to the single or specific structure. Their use indicates simply that the inflammation predominates in the structure named.

393. Pelvic cellulitis, parametritis, or **periuterine phlegmon,** is an inflammation of the pelvic cellular tissue. It may be

either primary or secondary: *i. e.*, it may have originated in the cellular tissue or may have reached it by extension from the neighboring structures. The primary inflammation is an acute infective disease which differs in no respect from acute inflammation of the connective tissue in any other portion of the body. Chronic pelvic cellulitis is always a secondary affection; never the result of acute cellulitis. The pelvic connective tissue is not a special structure, but a portion of that wide system of mesoblastic connective tissue which surrounds the great vessels of the trunk and accompanies their branches from origin to termination. It is found in the pelvis, partly in the form of a loose areolar network, partly in the more condensed form of fascia. It surrounds all the blood-vessels, nerves, and lymphatics, as well as the ureters, and serves as investing sheaths for them outside the pelvic cavity. It is closed off from the perineum and ischiorectal fossa by the pelvic fascia, a strong aponeurosis, which is attached to the pelvic wall between the pubic bones and bodies of the ischia, and along that thickening of the obturator fascia known as the white line. It passes as a continuous layer over the levator ani and coccygeus muscles to the vagina in front, and to the rectum and coccyx behind. It closely blends with the vaginal orifice, behind the pubic symphysis, as the triangular ligament. Inflammatory exudations of the female genital organs above the vulva are situated above this strong fascia. The cellular area with such a boundary below has the peritoneum for its superior limitation. This boundary, however, is less abrupt, as it is continuous with the subserous connective tissue of the parietal peritoneum of the abdomen. With the exception of the fundus of the uterus, it forms a layer beneath the entire pelvic peritoneum—both parietal and visceral. The so-called uterine ligaments contain more or less of it between their peritoneal folds, and in certain situations it is abundant; for instance, around the supravaginal portion of the cervix, and along the base of the broad ligaments and between the bladder and symphysis pubis. In the latter situation it contains a varying quantity of fat in its meshes.

Its office in the pelvis, as elsewhere, is to protect and support the other tissues, performing a passive mechanical function. It affords a cushion which prevents injury of the viscera (Schaefer). The connective-tissue layer, between the vagina and peritoneum posterior to the uterus, generally does not measure more than $\frac{1}{3}$ of an inch in thickness, but in pregnancy its thickness is greatly increased. During the progress of development of a pregnant uterus the broad ligaments are gradually drawn upward, until at the completion of the pregnancy they

lie in the iliac fossa, above the brim of the pelvis, while no peritoneum dips into the lateral parts of the pelvis. The space thus vacated is filled with connective tissue, which during the later months of pregnancy is enormously increased. Freund describes a form of cellulitis which affects more particularly the fatless connective tissue, or fascia, which he calls parametritis chronica atrophicans circumscriptum et diffusum. Cellulitis is a very common complication of pelvic peritonitis involving particularly the uterosacral ligaments and peritoneal folds. Schultze calls this parametritis posterior: uterosacral cellulitis is more accurate. Cicatrization of the ligaments following such inflammation causes traction upon the isthmus, and is a very common cause of dysmenorrhea and sterility. As a result of the contraction of the tissues, the uterus may be anteflexed and drawn to one side or backward, thus producing a pathologic anteflexion. By compression of the vessels and nerves the uterus and ovaries may become atrophied. Cellulitis may exist with or without suppuration. When suppuration does not occur, an exudation results in the connective tissue, which becomes edematous, and subsequently more or less organized, firm, and hard, causing pressure upon the vessels and nerves which pass through it. The changes in this structure are similar to those which take place in cirrhosis of the liver or of the kidney.

394. Etiology.—Primary pelvic cellulitis is always a result of sepsis. Ready entrance for septic material is afforded through lacerations of the cervix uteri. These injuries may be caused by the use of forceps, and, if kept aseptic, readily heal. In the nullipara cellulitis may arise from the same causes as pelvic peritonitis, such as exposure to cold during menstruation, being then generally associated with pelvic peritonitis, and from surgical operations which open the connective tissue, as in the removal of large uterine polypi, affording an opportunity for cellulitic infection. The danger is especially great when the growths are expelled or removed while in a state of necrosis. A certain amount of lymphangitis is then associated, with which the lymphatic glands may be implicated. Cellulitis may develop from disease in the bladder. As a result of such irritation thickening occurs in the connective tissue outside the bladder, which thickening passes outward and forward, and in ultimate atrophy may cause uterine displacement in the opposite direction. From the rectum, the causative irritation may be dysenteric. A pelvic cellulitic abscess is not infrequently so situated as to render it more than probable that the hypogastric glands are involved. Inflammation occurs much more rarely in the cellular tissue than in the pelvic peri-

toneum. With the advent of suppuration, an abscess follows, which is generally of large dimensions, although occasionally several abscesses may be found in close apposition.

395. Symptoms.—In puerperal cases the cellulitis is generally ushered in about the second or third day, with a rigor or chill, although it may occasionally occur later. In nonpuerperal cases the interval between infection and the first manifestation of symptoms is rarely more than one or two days. The occurrence of the chill has produced the belief that the inflammation arises from exposure to cold; simultaneously with the chill occurs an elevation of temperature, a rapid pulse, but rarely pain, unless the peritoneum is involved. When suppuration occurs, the most marked symptom is the progressive emaciation associated with pallor or earthy sallowness of the skin. The skin is harsh, dry, and covered with briny scales from the fine desquamation. Where peritonitis is established and the patient is consequently ejecting a dark green fluid from the stomach, and is unable to retain even liquids, the stomach should be irrigated through the stomach-tube with normal salt solution. This should be repeated, if the vomiting returns. No food, not even water, should be allowed to enter the stomach. Peristalsis should be quieted by morphin, gr. $\frac{1}{16}$, given hypodermically, every three hours. The nutrition should be maintained by rectal feeding, administering normal salt solution, three ounces, bovinine, one ounce, every three or four hours, and, where necessary, hypodermoclysis or intravenous injections of normal salt solution. The patient looks ill, loses her appetite, and suffers from marked debility and severe mental depression. She becomes very irritable. If the exudation extends to the fascia over the iliacus and psoas muscles, and particularly if the connective-tissue elements between these muscles are involved, the patient will lie upon her back with the leg of the affected side flexed and the thigh bent upon the trunk. The symptoms are those of a subacute form of septicemia. Pain and local signs may be so slightly marked as to lead to the condition being unsuspected or overlooked.

396. Physical Signs.—In the early stages of an acute attack the physical signs are but slightly marked. All that will be noticed by digital examination is that the vagina is hot and its vessels are pulsating. In a few hours there are indications of an inflammatory exudate. There is a doughy sensation and fullness on one side of the uterus and in the iliac fossa. This may extend partly around the cervix, and subsequently become hard and indurated. If the poison has entered through a wound in the cervix, the latter becomes less movable. The

supravaginal tissues on the affected side are tender, more or less hard, and unyielding. There is a bulging at the side of the uterus, and the lateral fornix on that side is apparently obliterated. (Fig. 307.) We rarely find both sides of the uterus affected at the same time, but occasionally the whole supravaginal portion of the cervix may be embedded in a thick collar of indurated tissue, which more or less completely surrounds it. Generally the disease spreads laterally along the base of the broad ligament to the tissue beneath the reflection of the peritoneum on the anterior abdominal wall. When this occurs, a uniform hardness, or resistance, is felt in the abdominal wall beneath the muscles. This may assume the form of a broad band, from $\frac{1}{2}$ of an inch to 2 inches or more in width,

Fig. 307.—Exudation in Broad Ligament from Pelvic Cellulitis.

which lies along the upper border of Poupart's ligament. Occasionally the exudation spreads upward and outward from above Poupart's ligament into the iliac fossa. This exudation may extend in one of two ways: (*a*) it follows the course of the lymphatics which run from the uterus outward beneath and between the layers of the broad ligament to the glands and lumbar region; (*b*) by lines of cleavage in the cellular tissue of the pelvis. In the latter form it not infrequently passes backward, producing an exudation in the tissue of one or both uterosacral ligaments in the tissue surrounding the rectum, and lines the posterior pelvic wall beneath the peritoneum. In these cases the rectum will be felt wholly or partly surrounded by a belt of exudation, which forms a bridge or an arch. If suppuration

does not occur, the exudation becomes absorbed, and in uncomplicated cases the hardness may so far disappear as to leave no subsequent trace. In not a few cases pelvic cellulitis results in the formation of an abscess. The situation of the abscess and the direction in which it may be expected to extend depend upon the situation and the extent of the inflammatory exudation. If the inflammation is seated in the base of the broad ligament and passes forward beneath the peritoneum, where it is reflected on to the anterior abdominal wall, an area of induration may be noticed above Poupart's ligament. Suppuration can be recognized by the occurrence over the indurated area of edema in the skin, which pits on pressure; by deep-seated fluctuation, especially recognized by bimanual examination; and by the eventual pointing of the abscess a little above Poupart's ligament. The pus can often be detected before it reaches the surface by passing the tip of the finger carefully over the induration, when a softened point will be recognized in the surrounding hardness. As we have already noticed, pelvic cellulitis may unfortunately extend backward instead of forward, when, if suppuration follows, an abscess forms beneath the peritoneum covering the back of the pelvis. Such an abscess has no direct access to the free surface, relief is much longer delayed, and extensive burrowing follows. It can extend into the iliac fossa and the loin, particularly when the posterior wall is the seat of the abscess. It may point at the iliac crest, or may sometimes leave the pelvis by the sciatic notch and follow the course of the sciatic or gluteal vessels. Again, it appears in Scarpa's triangle, having followed the side of the femoral vessels. By whatever route the abscess leaves the pelvis it will follow the blood-vessels or the ureter, which are accompanied by a prolongation of the connective tissue rather than by the nerves or tendons. When matter burrows along the psoas muscle, it comes, not from cellulitic abscess, but from dead bone, and this is an important fact to keep in mind.

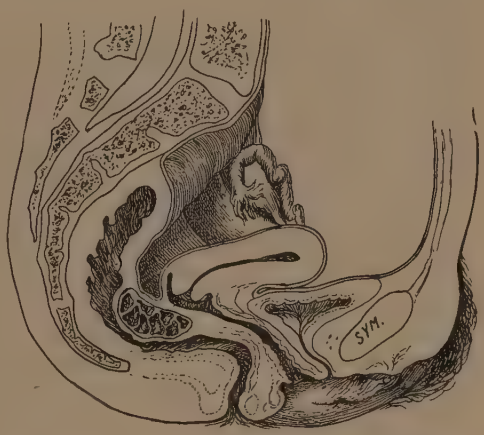


Fig. 308.—Exudation of Cellulitis over Rectum.

I saw with the late Dr. Kappes a patient who had been confined about six weeks previously, and she was suffering from what was apparently a subacute attack of septicemia. She was lying with her limbs drawn up, complaining of severe pain in the abdomen, extending into the groin. On examination, induration could be recognized extending from the left lumbar region into the groin. Vaginal examination disclosed the uterus freely movable, with no induration about it, nor in the pelvis, until the finger was passed well above the brim, when the indurated psoas muscle was recognized. On investigating the history of this patient it was found that she had suffered from a fall about the third month of pregnancy. She was walking on stilts in her back yard to amuse her children, when she tripped and fell in a sitting position. She suffered more or less discomfort during the entire remainder of the pregnancy. An incision was made on the left side over the crest of the ilium and the peritoneum was pushed forward, when the tissue of the psoas muscle was found infiltrated with purulent material. It was hoped that the vent thus afforded would give the patient relief. She improved for a few days, when pain occurred upon the opposite side, where a similar condition was found.

We not infrequently hear of cellulitic abscesses opening into the rectum, vagina, or bladder, but these cases, when considered in the light of the pathology of pelvic inflammation, are doubtful, and are more than likely cases of intraperitoneal suppuration which have originated either in disease of the Fallopian tubes or of the ovaries. An abscess will usually point between the seventh and twelfth weeks.

In discussing pelvic disease we should not overlook a peculiar malignant form of inflammation, mostly occurring in puerperal women, in which, associated with other lesions significant of the virulence of the infection, multiple abscesses in the connective tissue are found. Many of these abscesses are so small as easily to elude detection. The condition is known as diffuse pelvic suppuration, and has all the characteristics of phlegmonous erysipelas. The tissues become edematous and of a livid hue. Suppurating thrombi are found in the veins and the lymphatics are acutely inflamed. Occasionally, the ovaries may be found in a state of suppuration. Associated with this condition are all the symptoms of acute infection in its most virulent form.

397. Diagnosis.—The absence of pain not infrequently permits considerable progress before the existence of the condition is suspected. Puerperal women, because of the tenderness of the external genitals and the presence of the lochial discharge, are very averse to vaginal examination. If the

puerperium pursues a normal course this aversion should be respected, but it can not be too strongly asserted that examination should be made whenever symptoms of pyrexia supervene and the ordinary course of convalescence is interrupted. A temporary disturbance of temperature and of pulse-rate may result from such causes as constipation, excitement, and mammary engorgement. Unless such conditions can be recognized as provocative of the disturbance, or if the abnormal symptoms are persistent, and especially if the lochia is offensive, a thorough examination not only of the vagina, but of the interior of the uterus, should be made. During the first ten days subsequent to delivery the uterus can be readily explored without artificial dilatation. If a portion of placental tissue or a decomposing blood-clot is found, it should be removed, and the uterine cavity should be cleansed and disinfected. Ordinarily the symptoms will be promptly relieved. If they are not, the examination will have revealed the probable cause of the disorder, and simultaneously will permit any swelling or other morbid condition of the pelvic tissues to be detected. A few days after the onset of the attack the physical signs of cellulitis will be so marked as to render the diagnosis certain, and a laceration of the cervix or of the vagina will be disclosed as the probable gateway for the entrance of the infection. Occasionally the first indication of cellulitis will be an impaired mobility of the cervix upon one side, on which tenderness and swelling will be marked. Later, this inflamed structure becomes stiff, and passes to well-defined hardness. The cellulitis may be situated to one side of the cervix or may extend along the base of the broad ligament of the affected side. The lateral fornix of the vagina will be completely obliterated. When the inflammation extends backward, vaginal examinations of the posterior wall will reveal a diffuse fullness and hardness on the affected side, which is still further demonstrated by rectal examination. In the rare cases in which the broad ligament itself is affected the diagnosis is determined by finding the mobility of the body of the uterus impaired, and a more or less flattened mass of induration upon one side, which is continuous with the uterus. Excepting the plane of tissue between the cervix uteri and the bladder, the cellular area of one side of the pelvis is practically shut off from that of the other. Hence, we find pelvic cellulitis is for the most part unilateral. The differential diagnosis of pelvic peritonitis will be discussed later. (See Peritonitis.) The only other conditions with which cellulitis can be confounded are hematoma of the broad ligament and myoma of the uterus. In hematoma there is an effusion of blood into the connective tissue, which

forms a slightly movable, somewhat flattened tumor alongside of and continuous with the uterus. The history of the case and the absence of symptoms of severe illness will generally serve to distinguish it. It occurs suddenly, from rupture of a pregnant tube or of a varicose vein in the broad ligament. In either case the onset is marked by violent pain, faintness, syncope, and usually vomiting. In pregnancy of the tube one or two menstrual periods will have been passed, and the pain will be situated in the lower part of the abdomen, generally on one side, with irregular uterine bleeding. The effect of such an outpouring of blood upon the temperature and pulse is transient. The temperature is not elevated. If infection occurs, suppuration results, and the symptoms then are similar to those of pelvic abscess from cellulitis. Myoma can rarely be mistaken for cellulitis. Only in those rare cases in which the myoma develops laterally between the layers of the broad ligament and forms a more or less hard tumor directly continuous with it is error possible. Should the myoma be complicated by a localized peritonitis, or the tumor become inflamed or gangrenous, the diagnosis may be difficult. In the posterior wall error is scarcely probable, for large inflammatory exudations into the connective tissue behind the uterus are extremely rare. In the anterior wall the signs of cellulitic exudation between the bladder and the upper part of the cervix are well marked and characteristic.

398. Prognosis.—The disease usually terminates in recovery, except in the very diffuse variety, in which it is a part of a general septic process. With the subsidence of the fever the exudation is gradually absorbed, and under favorable circumstances entirely disappears in a few weeks. Cellulitis uncomplicated by peritonitis leaves no unpleasant results, no adhesions nor displacements. Its existence, consequently, is no bar to subsequent pregnancy. If fever continues longer than five or six weeks, suppuration has probably resulted. The duration and progress of the illness will largely depend upon the direction the pus takes. Generally it points above Poupart's ligament, where it can be easily and satisfactorily opened. Such cases invariably do well. In the rare cases when it occurs at the back of the pelvis, pus is longer in reaching the surface, and may burrow in different directions. Such cases often last a long time, and are likely to be complicated by extension to the peritoneum. When resolution and the absorption of the inflammatory processes are slow, the exudate will become organized, and cause cicatricial contraction and resulting displacement of the uterus. Such contractions also lead to atrophy of the uterus and ovaries. The obstruction

of the circulation produces localized congestion, and even inflammation, and causes disturbances of menstruation, such as menorrhagia and dysmenorrhea, and sterility. It is necessary, then, to be guarded in our promises of complete recovery.

399. Treatment.—A description of the disease and of its causes emphasizes the importance of preventive treatment. This consists in careful attention to the principles of asepsis or surgical cleanliness in all midwifery cases and in surgical manipulations. If freedom from infection could be insured, pelvic cellulitis would disappear. When the disease is once developed, medication, either internal or external, has but little influence. The most important indication is to avoid doing the patient harm. Particular care should be exercised in the administration of opium and antipyretics. The former agent is generally given as a matter of routine. Opium adds to the disturbance of the already obstructed digestive functions and aggravates one of the difficulties which it is important to obviate: viz., constipation. Opium or morphin should be given only in cases complicated by peritonitis, in which it is absolutely necessary to afford relief. Similarly, antipyretics should be reserved for the rare occasions when the temperature is so high as to constitute in itself a source of danger. A simple saline mixture, potassium citrate, or small, frequently repeated doses of magnesium sulphate should be given until the bowels are freely evacuated. Care should be exercised to avoid fecal accumulation. The question of feeding is of equal importance: farinaceous diet in the acute stages, with meat, eggs, and easily digested food in the later period of the disease. The tendency to emaciation calls for generous feeding. In the early stages of the inflammation an ice-bag over the abdomen will limit the congestion and the amount of inflammatory exudate. When the ice-bag is uncomfortable or causes distress, hot fomentations should be applied. Hot vaginal douches, at a temperature of from 110° F. to 115° F., are advocated by Emmet, although the influence they exert is doubtful. When pus forms, the case should be dealt with according to recognized surgical principles. The abscess should be opened as soon as fluctuation is detected or there is the faintest indication of pointing, and drainage should be instituted for a few days. If the abscess points in the vagina, it must be opened there. Most of the fluctuating swellings felt through the vaginal roof are not cellulitic abscesses, but come from an entirely different direction. While it is not generally recognized as the proper plan of treatment, yet, without question, the course of an abscess can be shortened by making an incision into the infected cellular tissue through the vagina as soon as the swelling about the

uterus can be recognized. The infected area should be broken into with the finger, and a gauze drain inserted which will afford vent for the discharge. The drainage thus secured will frequently obviate the occurrence and danger of suppuration and prevent the extension of inflammation to the pelvic peritoneum. If the patient lies with the thigh flexed on the body, the limb should be exercised by lifting the foot with the hand under the heel two or three times a day sufficiently to straighten the knee. This will prevent permanent contraction and stiffening of the joint.

Chronic pelvic cellulitis, as already asserted, does not exist as an independent affection or as a sequel of the acute disease. It not infrequently follows purulent salpingitis or other intrapelvic suppurative inflammation, and involves only the parts immediately contiguous to the inflamed structures. The induration which it causes, for a time, of course, introduces an element of obscurity into the diagnosis of deep-seated inflammatory lesions of the pelvis. It is rarely attended with cellulitic abscess, and is characterized chiefly by edema and small-cell infiltration of the connective tissue. Its absorption and the mobility of the uterus may be promoted by the practice of pelvic massage. (Section 169.) When cellulitis has existed sufficiently long to result in atrophy of the uterus or ovary, treatment exerts but little effect.

400. Pelvic peritonitis, perimetritis, perisalpingitis, or **perioophoritis,** is an inflammation of the peritoneum situated within the pelvis. It occurs much more frequently than pelvic cellulitis; indeed, more frequently than any other form of inflammatory disease within the pelvis. In the great majority of cases it is an infective process, due either to the presence of micro-organisms or to the effect of their chemic products. In the main its action may be regarded as beneficial, it being one of nature's efforts to resist or to do battle with the invading foe by erecting barriers around the diseased area. These barriers serve to narrow or to confine the field of invasion, and shield the neighboring structures from damage. Treves asserts that the purpose of peritonitis is to save and not to destroy life. Unfortunately, the poison may be so virulent or may exist in so large a quantity that we are neither able to limit nor to guide the inflammatory process to a successful issue.

401. Etiology.—Pelvic peritonitis probably never occurs as a primary disease, but always as a complication of a preexisting disorder. Occasionally, however, it is the first recognized expression of such disease. The symptoms of peritonitis are so severe that attention is at once aroused, while the condition from which it originated may have been so insidious

as to have been overlooked. From want of knowledge, then, of the previous condition we are often compelled to ignore the exciting condition, and to say that the patient suffers from pelvic peritonitis. Is it surprising that the original condition was formerly unrecognized and the disease denominated idiopathic peritonitis, the result of a slight injury or of exposure to cold? It is true there are still cases in which we are unable to discover the preexisting disease, but the number of such cases has become less and less frequent, and failure to determine the cause of pelvic peritonitis is the result of defective observation and of want of knowledge.

The most frequent cause is sepsis; next, gonorrheal infection. The micro-organisms principally concerned in the development of infection are the streptococcus, the staphylococcus, the gonococcus, the bacillus coli communis, and the bacillus tuberculosis. The propagation of these infectious micro-organisms is favored by parturition, abortion, instrumental examination, and surgical interference. Other causes are inflammations of the appendix, intestinal perforations, abdominal lesions, rupture of an ectopic gestation, hematocele, ovarian abscess, or hematoma, and malignant disease.

Infection generally reaches the peritoneum in one of three ways: first, by the continuous mucous membrane through the uterine cavity and tubes; second, by the blood-vessels; third, by the lymphatics.

Tubal disease is the most common cause of pelvic peritonitis, and should receive first consideration. The mucous membrane of the Fallopian tube is continuous with that of the uterus, and at its abdominal end opens into the peritoneal cavity.

The continuity of the tubal mucous membrane with that of the uterus and vagina subjects it to continual danger of infection. The tendency of every acute infective endometritis, whether septic, gonorrheal, or tubercular, is to extend to and involve the tube. The relation of the tubal mucous membrane to the peritoneum, in infection of the former, favors its extension to the latter. This risk is further aggravated by the anatomic position of the tube in woman. No other mucous membrane is similarly situated. The uterine cavity, when inflamed, naturally drains into the vagina through the external os; but the tube has its most constricted portion toward the uterus, where the lumen of the canal is but large enough to permit the passage of a bristle. A very slight amount of swelling will be sufficient to close the uterine end, when the only outlet of the tube is into the peritoneum. The absence of a suitable outlet for morbid secretions of the tube

and the continuity of its mucous membrane with the peritoneum render inflammatory affections of the canal of especial importance and make pelvic peritonitis so frequent a consequence of salpingitis.

A prompt result of peritonitis is closure of the abdominal ostium of the tube by adhesions or by inflammatory changes in the fimbriæ. The tube is then filled with retained secretion, and becomes the center for an inflammatory process which extends through the wall to the neighboring tissues, especially the peritoneum. If this extension is not an immediate occurrence, the tube is subject to frequently recurring inflammatory attacks from slight causes. When the retained secretion consists of pus, the liability to recurring attacks of pelvic peritonitis is much greater than when the accumulation is serous or mucopurulent, to which liability is added the danger of ulceration of the tube-wall and the possibility of pus escaping into the peritoneal cavity by perforation. Frequently the ovary becomes infected from the tube, suppurates, and affords a fresh source of danger. Both inflamed tube and ovary may act as sources of peritonitis, but sometimes the tube, after infecting the ovary, recovers and is no longer a focus for infection. Infection of the ovary is very prone to occur when the latter has been the site of cystic disease or when a Graafian follicle has recently ruptured. The most frequent mode of infection is through a cyst-wall which in places has become adherent to a diseased tube. Sometimes the infection occurs through an ulcerative process which permits the tubal contents to enter the cyst suddenly by perforation of the cyst-wall. Tubo-ovarian abscess is thus explained. Such an infection may produce an attack of peritonitis more violent than any preceding.

A more alarming attack of peritonitis is engendered by the escape, through ulceration, of the contents of a suppurating tube or ovary into the peritoneal cavity. Fortunately, such an occurrence is rare. The thinned wall of such a collection is a menace which places nature upon her guard and stimulates her to form adhesive barriers which will limit the space into which the rupture occurs and favors the formation of an intraperitoneal abscess. Such an abscess may rapidly enlarge, and, if the patient survives, may burst into one of the neighboring viscera, into the peritoneal cavity, or externally, according to its situation. Suppuration of an ovarian cyst may be independent of infection through the tube; occasionally, it more than probably occurs from the proximity of an inflamed growth about the rectum or intestine. The cyst is more vulnerable to such infection when it has been exposed to injury, or subjected to bruising, as in labor.

Peritonitis may be favored by twisting of the pedicle of an ovarian cyst. This accident can result in strangulation, intracystic hemorrhage, inflammation, or necrosis of the growth, according to the amount of strangulation. The accident is particularly prone to occur during parturition.

The presence of puerperal sepsis should be regarded as demanding careful investigation. New pelvic growths, by their mere presence, may engender peritonitis. This is common in ovarian tumor. The tumor varies greatly in the probability of its producing peritonitis. Uterine fibromata may attain a large size without adhesions unless degenerative processes set in, while a papilloma of the ovary or tube, dermoids, and malignant diseases are usually associated with extensive peritonitis.

Severe septicemia may follow abortion, parturition, or surgical manipulations, and, instead of being confined to the uterine mucous membrane, can at once be carried by blood-vessels or lymphatics to the peritoneum, and generate a diffuse septic infection in the pelvis. Such a peritonitis may become localized in the pelvis or may rapidly prove fatal by its extension to the general peritoneum.

Clinical experience has demonstrated that injury alone will cause peritonitis only when the hand or instrument inflicting the injury is surgically unclean. The truth of this assertion is illustrated by the infrequency with which extensive operative manipulation within the peritoneal cavity is followed by inflammation, and by the frequent attacks of virulent and fatal peritonitis following slight injuries in efforts to produce abortion. It is, without question, a mere problem of infection. The operator in the latter is usually ignorant or reckless.

Complications during parturition may cause peritonitis. The shape and size of the normal pelvis is adapted to the passage of the normally constructed child at full term, and is without extra accommodation. Any encroachment upon the pelvis by tumor, growth, or malformation, affords an obstacle which renders passage through the canal possible only at the expense of injury or bruising, which may result in loss of vitality of tissue or growth, and thus render the structures more susceptible to the influence of pathogenic micro-organisms.

Pelvic cellulitis, it has been said, is generally secondary, but still it may precede the peritonitis. This is particularly true of suppuration.

Pelvic hematocele is a source of peritoneal inflammation. The irritation induced by the blood diffused into the peritoneal cavity causes exudation and adhesive peritonitis. The

blood-serum may be roofed in beneath adherent omentum and coils of intestine, when the peritonitis limits effusion and promotes its subsequent absorption.

Inflammation of the vermiform appendix, or appendicitis, is a not infrequent cause of pelvic peritonitis. Its normal situation is in the right inguinal region, just above the brim of the pelvis, but instances have occurred in which it was found lying within the pelvis. In right-sided inflammation of the pelvic peritoneum an inflamed appendix should always be regarded as a possible source for the infection. An abscess formation may follow, which will fill up Douglas' pouch. In many cases it is difficult to determine whether the appendix or the right tube is the original source of infection.

402. Pathologic Anatomy.—Inflammation of the peritoneum may be serous, adhesive, or suppurative, and acute or chronic. As it most frequently originates from infection through the tubes, the tubes and ovaries are, therefore, implicated. It begins as a congestion or hyperemia of the serous surface, with cloudy swelling of the endothelium. The membrane, instead of being smooth and glistening, becomes dull, dry, clouded, and slightly roughened with plastic lymph, which is poured out between its adjacent surfaces. The adhesions thus produced are its most characteristic feature. In recurrent attacks we find additional adhesions. Serum exudation becomes encapsulated, is found in the meshes of the connective tissue, may fill the culdesac or pelvis, posterior to the uterus, or it may be encysted to one side. Such collections may simulate a cyst. When the exudation thrown out is considerable, it may form a distinct coating, which may be peeled from the surface of the peritoneum. These lymph coagula are also found floating in the serum, and, as the fluid becomes absorbed, this coating stiffens the peritoneum, and, with the induration in the subjacent cellular tissue, causes the hardness which is one of the striking characteristics of chronic pelvic peritonitis.

These indications of inflammation are usually most strongly marked about the fimbriated ends of the Fallopian tube, and diminish as they pass from it. When the inflammation has originated from some other cause, such as an inflamed appendix, the alteration and adhesions are most dense at the seat of origin. Thus, a Fallopian tube, when it becomes inflamed and increases in weight, drops from its original position, so that it is found upon the floor of the lateral fossa of the pelvis, in the pouch of Douglas, or adherent by its fimbriated end to the ovary or to the side of the pelvis. Occasionally, the two tubes meet, and the distal ends become adherent to each other behind the uterus. At other points the direction of the

tube may differ in two sides of the body. One side is bent like a horseshoe, while the other terminates against the lateral wall of the pelvis, to which it is adherent by its abdominal end. If the uterus is lifted out of the pelvis by pregnancy, the tube may be found situated above the brim, close to the border of the psoas muscle. The ovary is generally found implicated in the mass of inflammation which has extended from the tube. When this inflammation has existed for some time, we generally find the ovary in a cystic state, and considerably enlarged. These changes result from the effect of the surrounding peritonitis.

In chronic cases the peritoneum, in places, is lifted up by circumscribed collections of serous fluid in its meshes. These swellings vary in size from a pea to a large orange. They possess no pathologic importance, but often increase the difficulty in arriving at an accurate diagnosis. A mass formed by an inflamed tube, ovary, and broad ligament not infrequently is found adherent to the posterior pelvic wall and rectum. Sometimes a coil of intestine or a portion of omentum may intervene, when the parts are so entangled in an extensive mass of exudation as to cause great difficulty in outlining and determining their relations. The body of the uterus is enveloped in a mass of adhesions or is completely free. When the lesion from which the peritonitis has originated is purulent, peritonitis is also apt to be purulent, and, instead of an accumulation of serum, pus or intrapelvic abscesses are found. Occasionally, suppurative peritonitis exists. The latter occurs only in cases of exceptional virulence, or from sudden bursting into the peritoneal cavity of a pus collection which was situated in an ovary or tube. Intraperitoneal abscesses may be single or multiple. They generally originate by the rupture of a suppurating Fallopian tube, or by the discharge through its abdominal ostium of pus into Douglas' pouch or into a space bounded by adhesions. Both tubes may thus discharge into a common receptacle, which is most generally Douglas' pouch. A tense, fluctuating swelling is formed, easily felt through the depressed vaginal roof, which, by pressure against the intestine, causes more or less obstruction. Purulent inflammation of the tube leads early to closure of the abdominal ostium, when the pus is confined within the tube, and forms what is known as a pyosalpinx. An intraperitoneal abscess or general peritoneal infection may then be induced by infection through the tubal wall, or by the bursting of the pyosalpinx from ulceration within, or by the spread of infective processes to the ovary, causing it to suppurate.

An intraperitoneal abscess walled in by adherent viscera

may run an acute course or may be retained for a long time, causing few, if any, indications of its presence. One of two things is likely to occur, however: either the abscess gradually dries up and disappears, or its walls undergo ulceration and its contents escape into the bowel—usually the rectum, sigmoid flexure, or colon—or into the vagina, the bladder, the general cavity of the peritoneum, or some part of the abdominal wall. The most frequent exit is through the intestine. The other routes are exceptional. Such abscesses differ very markedly from cellulitic abscesses, and will quickly disappear when they have once found an outlet. The latter discharge their contents imperfectly. A troublesome sinus remains for years, producing serious ill health. Among the secondary changes resulting when salpingitis is unilateral is an extension of the peritonitis to the other side of the pelvis, involving the healthy uterine appendages in a mass of adhesions, which complicate the function of both tube and ovary. Such a condition may be followed by hydrosalpinx.

Hydrosalpinx may result as a sequal of salpingitis, but is rare.

Effusion of blood within the tube (hematosalpinx) in the great majority of cases arises as a consequence of tubal gestation, but occasionally may be independent of the latter.

403. Symptoms.—The first characteristic of acute pelvic peritonitis is pain in the lower part of the abdomen, which is sudden in its onset. For a few hours it is extremely severe, associated with fever, with an elevation of temperature, with increased rapidity of pulse, and often with vomiting. An early symptom is more or less intestinal distention, which may be general or localized. Following the acute pain, movement is attended with great suffering, because of the tender, inflamed parts, and the patient is generally obliged to remain in bed for a length of time dependent upon the severity of the attack. Rigors are infrequent, unless the condition is part of a diffuse septic inflammation, or the result of intraperitoneal rupture of a pyosalpinx or a suppurating ovary. Constipation is usual. Pain precedes defecation and micturition, owing to the contiguity of the inflamed part to the rectum or bladder. Not infrequently the pain is greater at the completion of micturition. The patient generally assumes the recumbent posture, with the limbs flexed, and guards the abdomen against the pressure of clothing or contact with the hand. In subacute or chronic cases there is pain in the back and inability to undergo physical exertion. Menstruation is more profuse than normal, often painful. Very trifling causes will result in recurrence of the attacks. This is particularly true when the chronic pelvic

peritonitis is maintained by the presence of pelvic suppuration. Recurrence of pain and abdominal tenderness are more reliable indications of the presence of pus than is elevation of temperature. Not infrequently a large quantity of pus may be found in the pelvis of the patient, who has either a normal or a subnormal temperature. Patients in whom extensive suppuration exists are found emaciated, and incapacitated for work or exercise. In the worst cases the patient will be bedridden. The amount of suffering depends upon the nature and extent of the disease and upon the social position of the patient; in other words, upon the demands that are made upon her activity. In an acute attack the abdominal muscles are kept rigid over the affected parts. This rigidity is due to muscular contraction, and is beyond the control of the patient. Occasionally, by abdominal palpation a definite swelling can be recognized. This is particularly true when the mass is situated above the brim of the pelvis, has attained a large size, or presents an encysted exudation of serum or pus in front of the uterus or against the pelvic wall. Occasionally, the abdominal enlargement will be due to the presence of serous fluid. When depression of the vaginal roof occurs, it will not be lateral, but central, because the accumulation of effusion, serous or purulent, is in Douglas' pouch. Upon vaginal examination the parts may be very tender, with a sense of resistance, or the uterus is pushed forward. After subsidence of the acute symptoms a careful bimanual examination, for which an anesthetic may be required, will often reveal in the posterior fossa of the pelvis the presence of a fixed, irregular, tender swelling. This begins at the uterine cornu as a cylindric body, equal in thickness to a lead-pencil; it may be rolled between the fingers, but may suddenly become thicker a short distance externally; it curves itself, may completely reverse its direction, and finally ends behind the cervix uteri in the pouch of Douglas. A Fallopian tube can be adherent to the ovary, which is embraced within the concavity of its curve, and surrounded on all sides by a thickened adherent peritoneum. The uterus is not always displaced, but is often found retroverted or retroflexed, and adherent in its abnormal position. Again, it may be pushed forward by a mass of effusion in Douglas' pouch. The shape and consistence of the swelling vary in different cases, as the tube may be soft, sausage-shaped, particularly when its abdominal ostium is occluded, or it may be distended mostly at the outer end, which gives it the shape of a retort. Occasionally it is irregular, distended from sacculation, thrown into knuckles or prominences, bent upon itself, with sausage-like convolutions produced by intervening

constrictions. Its consistence depends upon the extent to which the walls of the tubes have become thickened and upon the induration of the surrounding peritoneum.

404. Diagnosis.—Peritonitis may be confounded with hematocele and cellulitis. Pelvic hematocele is readily distinguished by its clinical history, slight febrile disturbance, history of a possible tubal gestation, severe pain attending the rupture of the latter, and the subsequent bloody discharge from the uterus. The distinguishing features between peritonitis and cellulitis are as follows:

Peritonitis.	Cellulitis.
1. Inflammation is chiefly confined to the pelvic peritoneum.	1. Inflammation principally affects the pelvic cellular tissue.
2. Inflammation is bilateral.	2. Inflammation is unilateral.

Differential Diagnosis.—

Peritonitis.	Cellulitis.
1. Its onset is sudden, with severe pain.	1. Its onset is insidious, pain not marked.
2. Both legs are drawn up.	2. One leg is drawn up.
3. A firm, flat effusion surrounds the uterus or a mesial bulging is produced by serous effusion in Douglas' pouch; the vaginal portion of the cervix is of normal length.	3. A firm effusion bulges usually into the fornix of the one side; the cervix is apparently shortened on the affected side.
4. The inflammation does not extend along the round ligament and iliac fossa; but it may affect the entire peritoneum.	4. Exudation, or pus, spreads in definite directions, and is usually localized.
5. The uterus is displaced forward or backward.	5. The uterus is displaced to one side.
6. Vomiting is frequent.	6. Vomiting is infrequent.

405. Prognosis.—The mortality of peritonitis is much higher than that of cellulitis. Even when the patient recovers, the after-effects are more troublesome, and not infrequently the sequels are sufficiently serious to entail a life of chronic invalidism. The disease from which the peritonitis originates remains after the subsidence of the acute attack, and constitutes a focus from which subsequent attacks are likely to result, either from changes in the diseased tissues or from external agencies. Recurring attacks of peritonitis are much more likely to occur when associated with the presence of pus, either in the form of pyosalpinx, suppurating ovary, or intraperitoneal abscess. The damage done to the uterus, ovaries, and Fallopian tubes, particularly to the latter, by the obstruction of the abdominal ostium necessarily causes sterility. If the gradual absorption of the morbid products permits the occurrence of conception, the continuation of pregnancy to

full term may be rendered impossible by the inability of the organ, from extensive adhesions, to reach its normal extension. It is not possible, however, to say that pregnancy can not occur, for experience has demonstrated that even after the most virulent peritonitis the parts may so recover themselves as to permit of a subsequent conception. The discreet practitioner will consequently hesitate positively to assert that the patient can not give birth to children. Another effect of pelvic peritonitis is *interference* with the normal action of the intestinal canal.

The final termination must depend upon the condition of the individual patient.

406. Treatment.—The first and most important aim of treatment is prevention. The large majority of non-puerperal cases of pelvic peritonitis originate from a pre-existing gonorrheal salpingitis; consequently, the treatment should consist in the arrest of the infection before it has extended beyond the reach of local application. Unfortunately, gonorrhea is very frequently regarded as an unimportant affection, although it probably destroys the health of a larger number of women than does the much more dreaded poison of syphilis. The earlier symptoms of the disease usually pass unregarded. They are attended with but little pain—often none, if the urethra is not involved—and the significance of the purulent discharge is not realized. Medical advice, consequently, is unsought until the infection has produced serious results or has inflicted lifelong damage. Even when advice is obtained, the disease is seldom regarded seriously, and vigorous treatment is not employed. A purulent vaginal discharge in a recently married woman should always be regarded with grave suspicion, and its treatment should be undertaken with a due sense of responsibility.

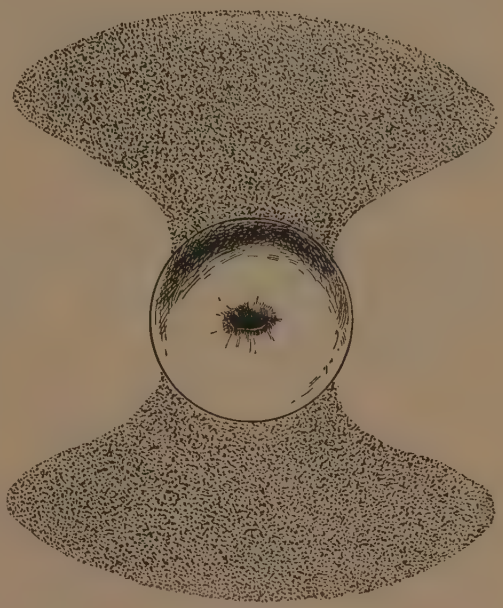


Fig. 309.—Induration from Peritonitis.

The object of treatment should be to prevent the extension of disease to the tube and the development of septic salpingitis. Its occurrence means a focus for the continuous distribution of infection and a cause for frequently recurring attacks of peritoneal inflammation. Such invasion, as would naturally be inferred, is a frequent consequence of gonorrhea, but its avoidance requires rigid adherence to the rules of aseptic surgery and midwifery in the management of abortion, parturition, and surgical manipulation. Care should be exercised in the examination of patients, and particularly when such investigation is to be intrauterine.

When the patient has once been the victim of pelvic peritonitis, it is extremely important that all causes likely to provoke a relapse should be avoided. She should be careful in her dress, should not be exposed to cold or damp, especially during her menstrual period, and exhausting exercise or overfatigue should be guarded against. Prolonged standing is as disastrous as excessive exercise. She should be cautioned

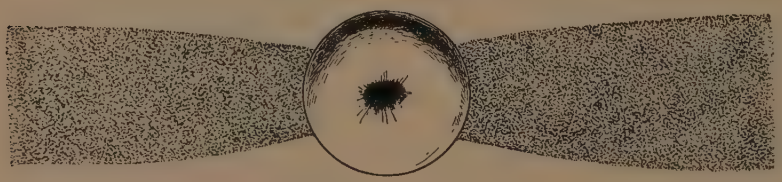


Fig. 310.—Induration from Pelvic Cellulitis.

to secure sufficient rest, and the state of her bowels should be carefully watched. Intestinal adhesions naturally increase the tendency to habitual constipation. The fecal accumulation favors the development and migration through the coats of the intestines of pathogenic micro-organisms, so the tendency to constipation should be overcome by suitable aperients, or by enemata of glycerin or of soap and water. The medical treatment is very similar to that employed in pelvic cellulitis, with the exception that opium and its derivatives may be necessary in some cases of peritonitis. Their administration, however, should be regarded as an unavoidable evil, and only small doses should be given, and these discontinued as early as possible. Constipation should be prevented by appropriate aperients or enemata, or both. Accumulation of scybala is more harmful than active purgation. During an acute attack the patient should rest in bed, and the diet should be restricted to liquid or easily digested food at regular intervals. The pain should be relieved by the application of the ice-bag, or,

if this is uncomfortable, by hot fomentations. Intestinal distention is relieved by the use of enemata. The patient will probably be tormented by thirst and by the desire for ice or to drink effervescent waters. She will find much greater relief from frequent sipping of hot water. Ice should be avoided, as, when once employed, it increases the thirst, and the patient will be constantly demanding it, with the result, if granted, that the mouth and tongue will soon suffer from a severe attack of glossitis. If the enemata fail to give relief, an aperient should be administered—doses of calomel, castor oil, or, what is more efficient, sulphate of magnesia. The latter may be given in one- to two-dram doses, dissolved in syrup of ginger and cinnamon-water, every two or three hours until the bowels are freely evacuated; subsequently three or four times a day, as the condition may demand. A palatable method of administering sulphate of magnesia is to give a teaspoonful of a saturated solution, which has been strained, mixed with an equal quantity of lemon-juice, and given while effervescing. The state of the pulse is a more correct guide to the condition of the patient than the temperature, and will indicate the need for stimulants. If the pulse shows signs of flagging, becomes thin, feeble, and intermittent, brandy or whisky should be given in regular doses, diluted with five or six times the quantity of water, its effect being carefully watched, the dose to be increased or diminished according to its influence. Stimulants should not be allowed to take the place of food. The indications of collapse—coldness of the extremities, sunken features, flagging pulse, subnormal temperature—should be further combated by the application of external heat and by the hypodermic injection of strychnin and atropin or digitalin. The intensely depressing effect of intestinal distention should be kept in mind, and this condition should be relieved by the use of enemata or by the introduction of a soft-rubber rectal tube with the patient turned upon the side. Not infrequently, as suggested by Keith, an injection of quinin, gr. vj, whisky, f℥ss, and water, f℥ij, repeated every hour until three doses have been given, stimulates the nerve centers and increases peristalsis. The most effective enema is an ounce of powdered alum dissolved in a quart of hot water. This is best given with the patient in the position with the hips elevated. This enema promotes peristalsis, and, consequently, is of service in tympanites. Where peritonitis is established and the patient is ejecting a dark green fluid from the stomach, and is unable to retain even liquids, the stomach should be irrigated through the stomach-tube with a normal salt solution. This should be repeated if the vomiting returns. No food, not even water, should be

allowed to enter the stomach. Peristalsis should be quieted by morphin, gr.$\frac{1}{16}$, given hypodermically every three hours. The nutrition should be maintained by rectal feeding, administering normal salt solution three ounces, bovinine one ounce, every three or four hours, and, where necessary, hypodermocleisis or intravenous injections of normal salt solution can be employed.

The occurrence of peritonitis should lead to a careful examination of the pelvis, and any indication of tenseness in Douglas' pouch or about the cervix should be considered an indication for immediate vaginal incision to break up the tissue and permit the fluid to escape. The opening should be kept patulous by the introduction of a gauze drain. Such a course will not infrequently arrest or limit the progress of the inflammation. The mere removal of the tension affords great relief. If an intraperitoneal abscess exists, such interference not only affords relief, but may anticipate its bursting into the rectum and the establishment of a troublesome sinus. Unless such conditions can be determined, however, it is wiser to defer surgical intervention until the acute symptoms have subsided. If the attack is the first the patient has had, and the swelling is so slight as to indicate a possibility of a probable nonpurulent inflammation, operative interference should not be advised. If the patient has repeatedly had similar attacks, and swelling of such a size is found as to render it probable that in its midst there is an occluded, distended Fallopian tube or an enlarged, cystic ovary, operation should be urged. Such a mass, with the recurring attacks, almost positively indicates the presence of pus; and where pus is present, surgery is absolutely indicated. It is impossible, of course, to lay down positive rules: every case must be decided upon its merits. A woman from the laboring class can not afford to spend as much time in invalidism as a woman in better circumstances.

When operation has been decided upon as necessary, the method of procedure still remains undetermined. Abdominal section being the older and more generally adopted procedure, it will be first described. For the preparation of the patient see Section 124. The patient is placed upon the operating table, preferably one by which the Trendelenburg posture can be secured, and an incision from $2\frac{1}{2}$ to 3 inches long is made in the median line, beginning an inch above the symphysis pubis. The operator must remember the possibility of adhesions between the intestines, the omentum, and the anterior abdominal parietes, and should proceed carefully as he approaches the peritoneal cavity. Generally the omentum is adherent to the mass in the pelvis, over the surface of the uterus, the tubes,

or the ovaries. The first step is to separate these adhesions, and to free the omentum and any coil of intestine which may be adherent. The omentum and intestines are drawn upward to expose the matted contents of the pelvis behind them. When the patient is lying flat, we have to be guided almost entirely by the sense of touch. In the Trendelenburg posture we are aided in our manipulations by sight. Following the fundus of the uterus as a guide, the operator endeavors with the tips of the first two fingers to enucleate the diseased uterine appendages from their adherent surroundings. The fundus of the uterus may be free or implicated in the adherent mass. In the latter case its identification may be exceedingly difficult, rendering it necessary for an assistant to pass one or two fingers into the vagina to elevate the uterus by pressure against the cervix. The fundus is thus identified. The affected tube, on one side, is traced out from the uterine cornu and made to serve as a guide when searching for planes of adhesion. If it turns backward and becomes lost in the adherent mass, the safest way is to keep the fingers close to the posterior surface of the uterus, and to trace the adherent mass downward to Douglas' pouch. In breaking up the adhesions it is necessary to separate the mass from the walls of the bowel, including the anterior wall of the rectum. It is often advisable to have an assistant pass his forefinger into the rectum, partly to facilitate the separation by steadying the bowel, partly to ascertain where the bowel is and whether the manipulation is in dangerous proximity to it. The separation of these adhesions in Douglas' pouch is generally the most difficult part of the operation. Indeed, I know of no operation more difficult than to have to break up adhesions which have existed for a long time between knuckles of intestine and the fundus of the uterus or the ovaries and tubes. The separation is to be continued posteriorly from below upward. When the mass has been cleared from its posterior and inferior attachments to the uterus and to the uterine appendages of the opposite side, there still remain adhesions to the back of the broad ligament, which has become more or less folded over the diseased parts, and forms a deep, concave surface on its posterior aspect. This concave surface has to be unfolded in order to permit the mass to be brought into view and the broad ligament below it to be transfixed. This separation can be accomplished by working from below upward, and should be continued until the ovary and tube remain attached to the uterus and broad ligament by their anatomic connections only. The pedicle is then tied in the same manner as in the removal of the normal ovary and tube for the relief of myoma. The appendages on the opposite

side are examined, and are removed or left, according to their condition. If merely adherent, the operator may content himself by simply separating the adhesions.

During such manipulation it is not infrequent to find an escape of pus, which may be independent of any fault of the operator. It is often difficult to accomplish without rupture the separation of adhesions around the ostium of a suppurating tube or the enucleation of a suppurating and adherent ovary the wall of which is thinned and nearly ready to burst. Fortunately, unless the pus is unusually virulent, no serious harm

Fig. 311.—Intestines Held Back by Gauze. Patient in Trendelenburg Posture.

results. However, we should always exercise care, in such cases, to wall off the general peritoneum and intestine with several layers of gauze pads, to prevent their being soiled. (Fig. 311.) Occasionally, in severe cases, when the patient is much depressed, the persistence required for the separation of extensive adhesions would so prolong the operation as to endanger the life of the patient. It may be necessary then to content ourselves with mere emptying and draining of the suppurating cavity. The greater the experience of the operator, however, the less frequent will be the incomplete operation.

Separation of adhesions between different parts of the intestinal canal other than the rectum should be made as much as possible under the eye, and any injuries to these structures should be immediately repaired. The inexperienced operator should be careful not to mistake a thickened and adherent intestine for an inflamed Fallopian tube. This mistake may be avoided by following the tube toward the uterus before an effort is made toward its separation.

During the performance of these operations the general peritoneum should be carefully protected by drawing back the intestines and omentum, and retaining them with gauze or gauze sponges, so that they shall not be soiled by rupture of an abscess cavity. After the completion of the operation, and when the parts have been dried, it is well to douche the cavity plentifully with hot normal salt solution, cleansing the surface by irrigation rather than by the use of the sponge or its substitutes. Drainage must be decided by the indications of the individual case. The larger the experience of the operator, unless he is particularly prejudiced, the less frequently will he be likely to use drainage. Even in the most virulent cases, with extensive adhesions, irrigation of the cavity with a large quantity of normal salt solution, repeating it before the cavity is closed and leaving a considerable quantity of fluid within the abdomen, dilutes any poison that may remain and renders it less active and less likely to produce deleterious effects. In this way drainage may be avoided. In suppurative peritonitis McCosh suggests intra-intestinal injections of saline cathartic. He cleanses the peritoneal cavity thoroughly with irrigation instead of sponging. Through a hollow needle, between one and two ounces of a saturated solution of magnesium sulphate is introduced into the small intestine at a point as high as possible in the jejunum or ileum. The needle-puncture is closed by a Lembert suture. The action of the saline produces free watery discharges, and thus makes the intestine act as a drainage-tube for the peritoneal cavity. When drainage is used in suppurative cases, the gauze or wick drain, in which a number of strands are introduced into different parts of the abdominal cavity, is the preferable method of drainage. If the ends are carried well around the side of the body, and are surrounded by cotton and gauze at a point below the level of the internal ends, we then secure a siphon-like action, which more effectually drains the cavity.

Postural drainage, recently suggested by Clark, utilizes the healthy and unirritated portion of the peritoneum for absorption. He recognized that, in the ordinary positions of the body, fluids, serum, and blood are likely to accumulate on that portion

of the peritoneum which has been injured and less able to take care of them, and in which there are, possibly, still remaining tissues impregnated with pathogenic germs. A culture-fluid is thus brought in contact with the germs at the most favorable temperature. Such a misfortune is avoided by elevating the foot of the bed thirty-six inches. The patient is occasionally turned, from side to side, so that no fluid accumulates in the pelvis, but is drained upward upon the healthy peritoneum, which is abundantly able to take care of it. This posture also, by decreasing the amount of blood that is sent to the injured part, saves the patient from very much of the distress which ordinarily results from the operation. Another advantage of this procedure is that it permits us to close the wound, to avoid the annoyance of a weakened abdomen, and thus to decrease the risk of hernia. In closure of the wound we must endeavor to utilize such measures that will bring together and hold in apposition the tissues, so that firm union may be secured and the risk of hernia lessened. Various methods of procedure

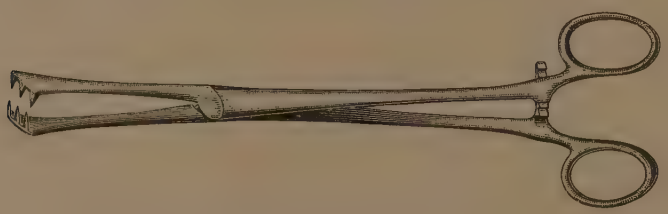


Fig. 312.—Three-pronged Vulsellum.

have been employed to accomplish the purpose: the introduction of a double row of sutures or of a series of sutures, one in the peritoneum, another in the aponeurosis, and another in the skin. The difficulty in the introduction of rows of sutures, however, is that not infrequently there are left dead spaces, in which an accumulation of fluid occurs. This later becomes infected and results in the formation of an abscess, which necessarily weakens the wall. I endeavored to obviate this difficulty by the employment of the figure-of-8 suture. The suture was made to cross just in front of the aponeurosis or that portion of the abdominal wall which it is most important should be maintained in apposition. The figure-of-8 suture was designed to accomplish the same purpose as a double row of sutures, but affording the advantage that the suture could be removed. It was found to have the disadvantage, however, that in order to secure apposition of the tissues, the suture was likely to be drawn so firmly as to result in a slough, which produced a stitch abscess.

I have experienced the greatest satisfaction by a com-

bination of continuous chromic catgut suture with interrupted silkworm-gut sutures. Beginning at either angle of the wound, the catgut suture is introduced external to the aponeurosis upon one side of the wound, brought out in the peritoneum and fascia of the opposite side, and then through the edges of the peritoneal wound until the other angle of the wound has been reached, when it is brought out above the aponeurosis. The silkworm-

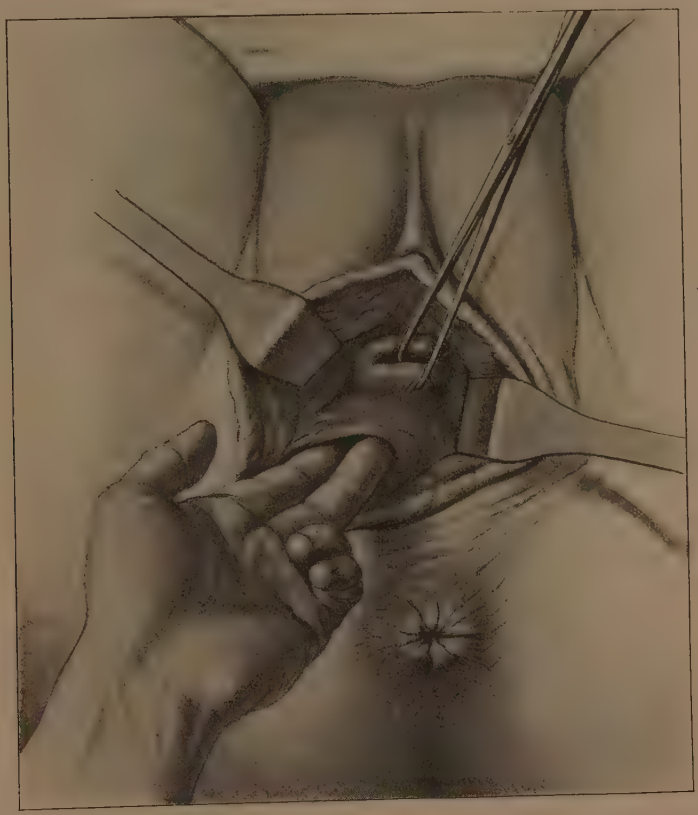


Fig. 313.—Vaginal Incision for Pus Collection in the Broad Ligament.

gut sutures are now introduced, including all the tissues above the peritoneum, the wound is cleansed, and the catgut suture continued, uniting the edges of the aponeurosis, when the wound is carefully dried before the introduction of the last turn and the tying of the knot. Again drying the wound, the silkworm-gut sutures are tied. This procedure gives secure union of the peritoneum, aponeurosis, and skin with but one

buried knot. When twenty-day catgut is used, the wound should be firmly secured against subsequent weakness.

The silkworm-gut sutures serve as supports to the wound, and should be tied only closely enough to hold the surfaces in apposition. The after-treatment is similar to that of other abdominal operations. (Section 143.)

Vaginal Section and Uterine Castration.—Many clinical observers have appreciated that the infected uterus, from

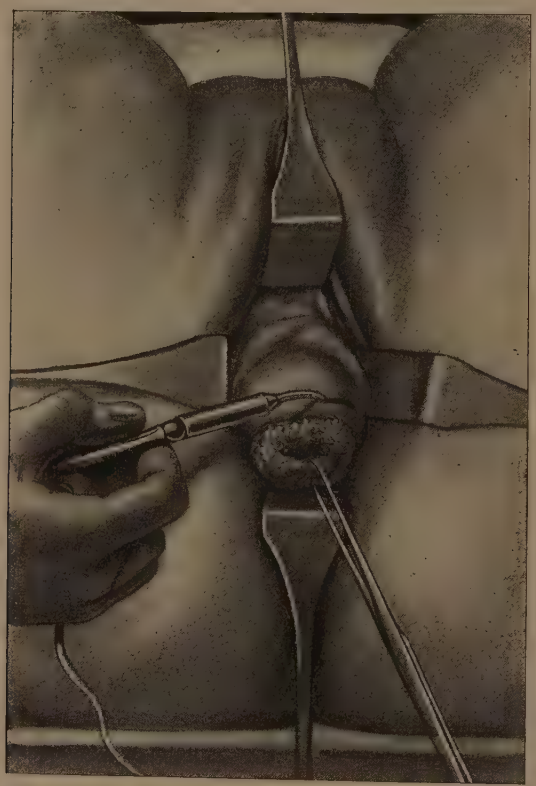


Fig. 314.—Incision through Vagina with Thermocautery in Vaginal Excision of the Uterus.

which the disease had been transmitted to the peritoneum and appendages, has continued to be a cause for discomfort and ill health after the secondary foci of infection—the appendages—have been removed.

Pean, in 1886, to insure relief in such cases, advocated the removal of the uterus through the vagina as a routine procedure in all cases in which that organ had been involved in

an infectious process. This operation he designated as uterine castration. The procedure was subsequently popularized by the advocacy of Segond and Jacobs. The diseased appendages may or may not accompany the uterus in its removal. In preparing for this operation the following instruments should be sterilized: Three double tenacula; four vaginal retractors; a knife; one pair of straight scissors and one pair curved on the flat; four large and twelve small pressure forceps; an

Fig. 315.—Clamp Forceps for Securing the Broad Ligament.

angiotribe; Deschamps ligature-carrier; needle-holder; needles, threaded with silk loops; chromic catgut, sizes 0 and 2. The operator may also have at hand the thermocautery and a large number of sterile gauze sponges. The steps of the operation are similar to those in the performance of the ordinary operation of vaginal hysterectomy. The patient is prepared as directed in Section 119. She is placed in the lithotomy position, and the uterus is exposed by the vaginal retractors, one anterior, a second posterior, and one on each side. These retractors

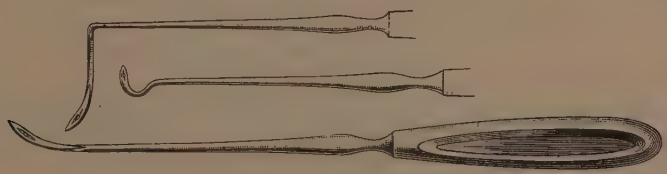


Fig. 316.—Deschamps Needle Ligature Carrier.

are held by two assistants. The cervix is seized by a vulsellum or double tenaculum, dragged down, and a circular incision made through the vaginal walls, which will be nearer the os externum anteriorly than posteriorly. Behind the incision extends for half an inch or more above the os, and, if required, additional room can be secured in the vagina by lateral incisions in the vaginal wall which extend for half an inch outward from the circular incision, and parallel with the broad ligament. The incision about the uterus is often made

with the thermocautery, which has the advantage that, in addition to decreased bleeding, the burn prevents the surfaces from immediate union and affords better opportunity for drainage. After cutting through the vagina the tissues are pushed away from the cervix with the finger, the separation between the bladder and the cervix is accomplished by blunt dissection with the finger or some blunt instrument, or by successive snips of the scissors. The late Joseph Eastman inserted the scissors, closed, near to the cervix and then separated the blades,

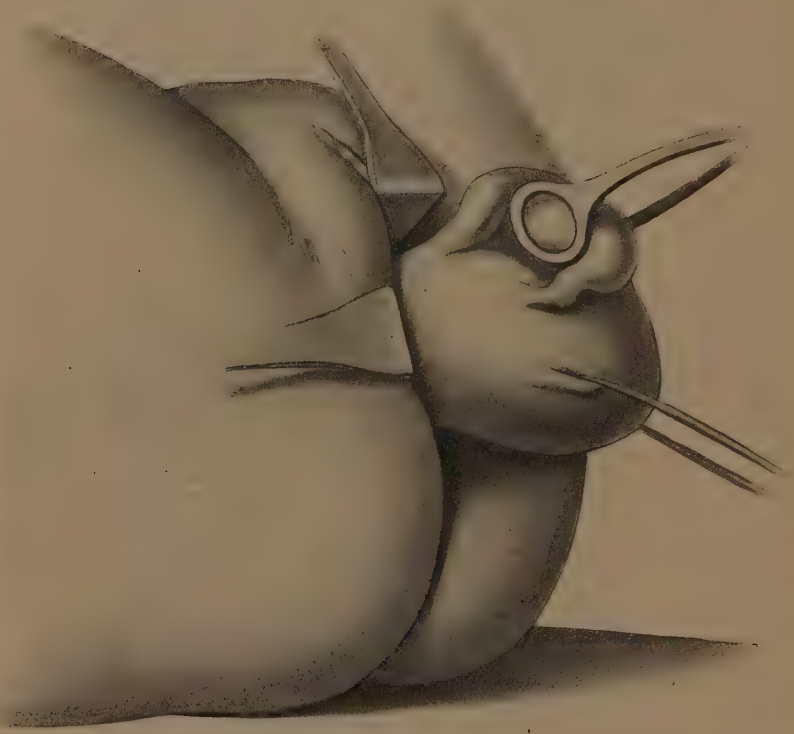


Fig. 317.—Drawing Down the Fundus.

which facilitated the dissection. The dissection can be more rapidly accomplished posteriorly, as there is but little danger of injuring the rectum. The dissection is completed front and back by opening the peritoneal cavity when the uterus is held by the broad ligaments, through which pass the uterine and ovarian arteries. The tissues upon each side are divided with successive snips of the scissors, and the uterine artery is seized with forceps as soon as exposed, or immediately when

cut. The fundus of the uterus can then be tilted forward through the anterior fornix of the vagina. This permits the cervix to be carried upward. With the fingers passed over the fundus of the uterus the ovary and tube are followed upon the tense surface of the broad ligament and dragged down, when a pair of clamp forceps can be placed upon the broad ligament to secure it. This is usually done first upon the left side, after which the broad liament is cut between the uterus and the forceps. This permits the more ready access to the right tube and ovary, as the fundus of the uterus is turned out of the way. This tube and ovary are brought down in a similar manner, the broad ligament clamped external to them, and the mass cut away. We have now the bleeding vessels secured by the pressure forceps. If the condition of the patient is such as to make an expeditious operation desirable, it may be completed by simply packing the vagina with gauze between these forceps, carrying the gauze well over the ends of the forceps in order that the intestine shall not impinge against them and become injured. The forceps and vulva are covered with a sterile dressing and the patient put to bed. The forceps should be allowed to remain for forty-eight hours, the gauze for four or five days. The clamp method, while expeditious, has the disadvantage, however, that the tissue enclosed in the grasp of the forceps undergoes necrosis and

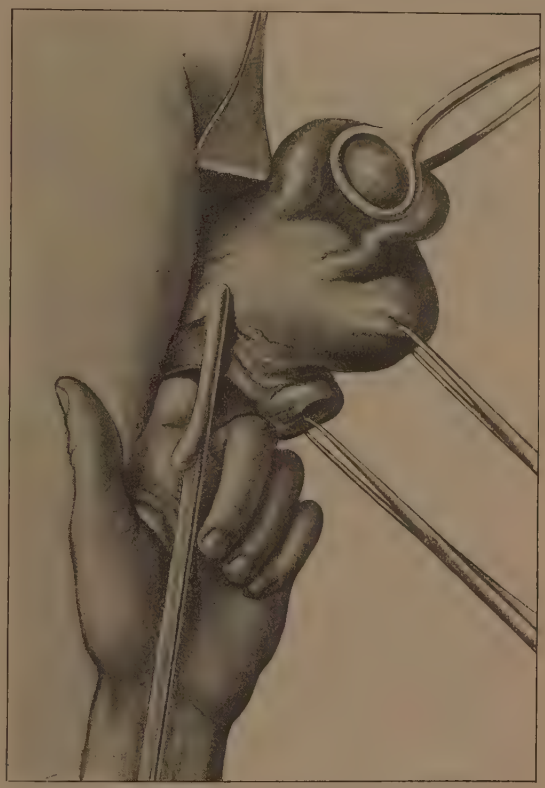


Fig. 318.—Application of the Clamp Forceps to the Lower Portion of the Broad Ligament.

causes a disagreeable odor for two or three weeks subsequent to the operation. This condition is a worry to the patient, nurse, and physician. There is always a possibility of the infection of the structures and of the peritoneal cavity, so that the majority of operators prefer to employ the ligature. The upper part of the broad ligament, that in the grasp of the upper clamp, may be crushed with the angiotribe and ligated with chromic catgut in the groove. The angiotribe, however, should not be employed if the tissue has undergone inflammation

Fig. 319.—Ligation of the Broad Ligament in Vaginal Hysterectomy.

and contains more or less exudate. The angiotribe crushes this tissue, indeed, almost bites it off, and, therefore, does not preclude the possibility of bleeding. Care must be employed in the use of the ligature to make sure that it is firmly tied and that it does not slip. The uterine arteries, if they are in the grasp of the small forceps, may be ligated with catgut. These, if they have been picked up separately, do not require a large mass within the ligature. In the employment of liga-

tures in the pelvis, the catgut should be preferred, although it has the disadvantage of being more likely to slip. The ligature here is very likely to become infected, consequently, if it is a silk ligature, it leads to a profuse discharge, to the formation of extensive granulations, and to a condition which is uncomfortable to the patient and a source of worry to the physician. Therefore, the chromic catgut should be employed in preference to the silk, which is almost certain to become infected. The ideal method of operating is that in which the electrothermic angiotribe is employed, as devised by Dr. A. J. Downes. This cooks the tissues to such a degree that hemorrhage is effectually controlled, and hence no ligature remains to act as a source of irritation. When the inflammatory exudate in the pelvis has been extensive, and has gone on to suppuration, so that we have pus sacs in the broad ligament or in Douglas' pouch, the preferable plan of procedure is that the incision should be made through the posterior culdesac, the pus sacs opened, evacuated and irrigated before the general peritoneal cavity has been opened and disturbed. Gauze may be packed into the pelvis temporarily during the remaining steps of the operation. In some cases the uterus is so bound down by inflammatory exudate that the dissection through the anterior fornix of the vagina is somewhat difficult. In these cases the operation may be expedited by splitting through the anterior lip of the uterus, holding each side of the organ with

Fig. 320.—Upper Portion of the Broad Ligament Secured by Clamp Forceps.

the double tenaculum, and drawing it down while the cervix is being split. This affords a better opportunity to observe the relation of the bladder and the uterus, and to keep within the layer of connective tissue in the septum. Splitting the cervix and making traction upon its sides enable us to see the relation of the bladder and, consequently, to avoid injuring it. Another modification is the amputation of the cervix after the lower part of the broad ligament has been cut through. This permits the more ready rotation downward of the fundus through the anterior fornix, as it has a shorter arc through which to rotate. The fundus of the uterus may be rotated through the posterior fornix, but the anterior is preferable,

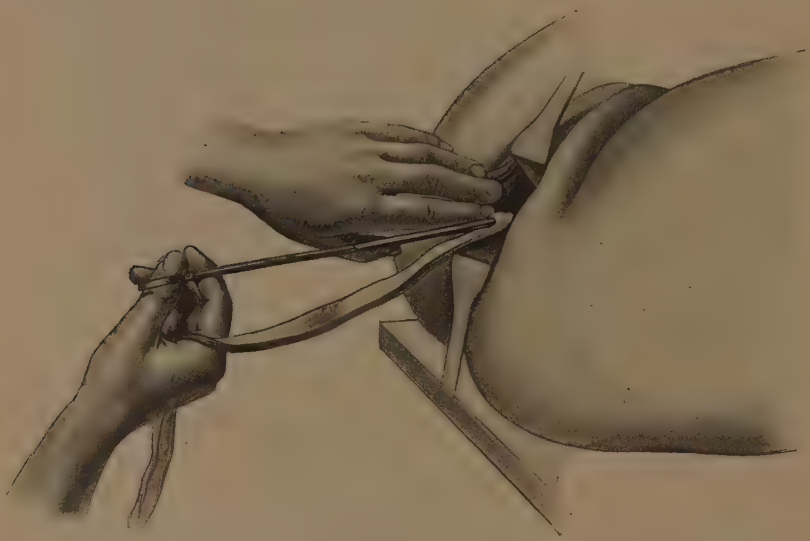


Fig. 321.—The Introduction of Gauze after Removal of the Uterus.

for the reason that it puts the broad ligament more readily upon the stretch and enables us the better to find the lines of cleavage between the tube and ovary and the other adherent viscera. If the ovary and tube are not readily brought down, or if the patient is suffering from chronic hyperplasia of the tubal and ovarian structures, by which these organs are often largely obliterated, we may apply the clamp on either side of the uterus prior to its removal. After the removal of the uterus we can then proceed in our effort to remove the appendages upon each side; but should we fail in this or if the adhesions are very firm, these structures may be permitted to remain, taking care, of course, that all pus pockets have

been thoroughly broken up and packed with iodoform gauze. The great majority of these cases have been infected. It is certainly preferable to treat the wound open by packing it with iodoform gauze rather than to close the vagina and peritoneal surfaces. Landau advocates and practises the bifurcation of the uterus through the antero-posterior line as a preliminary. One half of the organ is pushed upward, the other is drawn down. This procedure affords much more room for

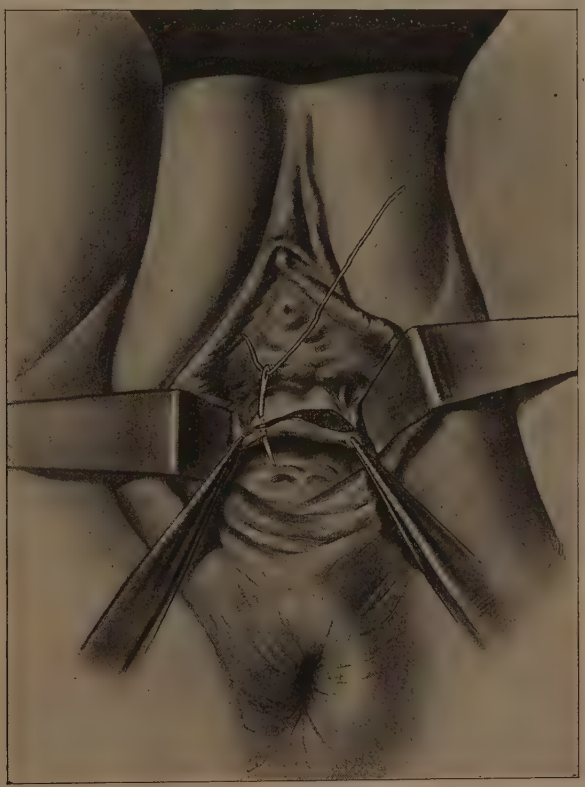


Fig. 322.—Closure of the Vaginal Wound by Sutures.

the manipulation necessary in the application of forceps, the use of the ligature, or in crushing with the angiotribe. It affords better opportunity, also, for dealing with the infected tube and ovary. As a preliminary, the peritoneum can be protected by packing with sterile gauze before we proceed to enucleate or separate the ovary and tube. In the employment of pieces of gauze it is very important, however, that the end

of the gauze should be fixed with a pair of hemostatic forceps, as the gauze is very readily worked upward into the peritoneal cavity by intestinal peristalsis, and, therefore, it may get beyond the reach of the surgeon. Nothing is more annoying than to expeditiously perform an operation and then have to

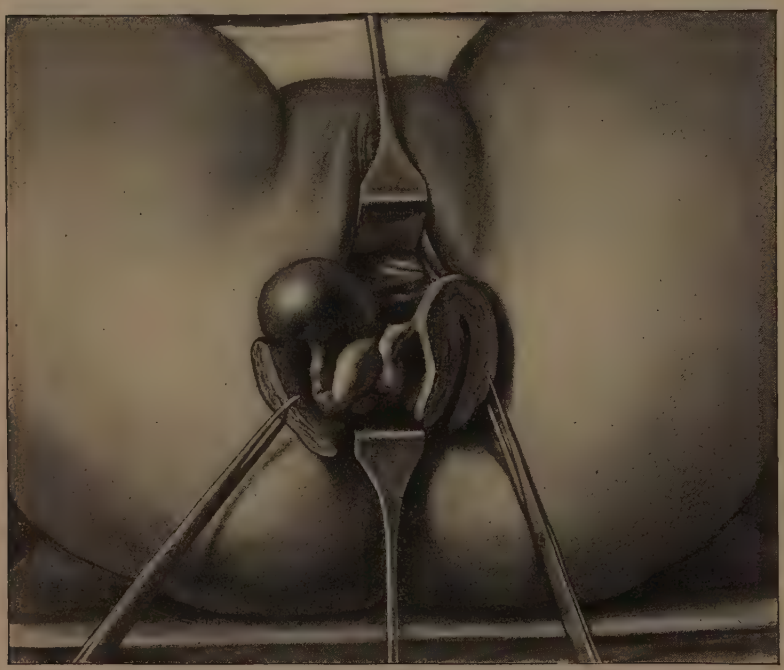


Fig. 323.—Landau's Method of Delivering the Uterus after Its Complete Median Section.

lose valuable time in hunting sponges. The nurse who dispenses the sponges should do nothing else, and should keep an accurate account of the number of sponges she has given out. These should be accounted for before the operation is considered completed.

DEVIATIONS OF THE PELVIC ORGANS.

407. Changed Relations of Structures of Vulva.—The relations of the structures of the vulva are modified and distorted by hypertrophy, by varicose veins, by inflammatory exudates and deposits, by edema, and by hernia and tumors, but they are, however, so intimately connected with the deeper structures that they are not subject to anything like displacement. All the other pelvic structures are capable of more or less marked displacement, still all are so closely related to and dependent upon uterine deviations that we will proceed

Fig. 324.—Uterus Displaced by Distended Bladder.

to the consideration of the uterus and its displacement as a primary subject.

408. Physiologic Movements of the Uterus and the Forces by Which It Is Sustained.—The uterus is a freely movable organ. It is suspended in the pelvis, with its fundus at or a little above the level of the brim of the pelvis, by the action of the uterosacral, the uterovesical, and the inferior portion of the broad ligaments, and occupies the axis of the pelvis, with its cervix directed toward the last sacral vertebræ. The supports of the uterus are not ligaments in the ordinary sense,

but consist of connective tissue, into and through which run prolongations from the uterine muscular structure, so that the organ is virtually sustained by muscular action. That the uterus is supported by muscular action is evident from the fact that the organ moves upward and downward with every respiratory excursion, changes its position with that of the body, and is influenced by the distention and condition of the surrounding viscera. In the normal position, the uterus rests forward upon the bladder, in a position of slight anteflexion, while the cervix is directed almost at a right angle to the axis of the vagina. Such a position is markedly changed

Fig. 325.—Uterus Displaced by Impacted Rectum.

by the distention of the bladder, which raises the fundus and decreases the angle between the uterus and the vagina until it becomes exceedingly obtuse (Fig. 324), and in marked distention, indeed, the uterine axis becomes nearly parallel with that of the vagina. The cervix is pushed forward by distention of the rectum. (Fig. 325.) When the rectum and the bladder are both distended, the organ is elevated, and no longer finds room between these two viscera. It will be seen that the muscles, arranged as just mentioned, support the cervix. The movements of the body of the organ are influenced by the broad ligaments on each side, which prevent it from un-

dergoing lateral change of position, and by the round ligaments, which act as stays to prevent it falling backward, or to draw it forward, when the bladder is emptied. The round ligaments are, of course, an insignificant force, but it must be remembered that the uterus weighs less than an ounce, and we can understand, therefore, how they serve to maintain the uterus far enough forward to permit the intra-abdominal pressure to be directed against its posterior surface. So long as the intra-abdominal pressure continues upon the posterior surface of the uterus, it is held forward against the bladder. It is also important for the maintenance of the uterus in its normal

Fig. 326.—Scheme of Dislocated Uteri.—(*Dudley.*)

place that the muscular structure of the pelvic floor shall remain in normal condition. Relaxation of the vaginal walls and of the muscular structure, occasioned by injury to the pelvic floor in which the perineal muscles are torn through,—and, particularly, the levator ani,—withdraws a support, which sooner or later favors displacement. The normal condition of the peritoneum is a factor. This structure is certain to be affected by loss of muscular tone and of muscular support. It is not one factor, then, but several, which combine to maintain the uterus in its normal relations.

409. Pathologic Changes and What Constitute Them.—From what has been said of the physiologic changes of position in the situation of the uterus it can readily be perceived how difficult it is to draw the line of demarcation between physiologic and pathologic changes. It may be said that when the uterus undergoes such changes in its structure or in its envelopes that it becomes stable in a position which is at times regarded as physiologic, it becomes pathologic and is known as displacement. Thus, the uterus may be pushed forward by a distended bladder, which will increase the angle between its axis and that of the latter; but if it does not follow the bladder forward when that organ is emptied, the position becomes abnormal.

Fig. 327.—Uterus Pushed up by Tumor in Douglas' Pouch.

These changes may result from:

1. Neglect of hygiene on the part of an individual, either in permitting the bladder to become habitually overdistended or the rectum to be loaded with fecal matter until the uterus is so driven back that the intra-abdominal pressure is no longer directed upon its posterior, but falls upon its fundus or anterior surface, which will lead to changes productive of an abnormal fixation.

2. Inflammatory changes in the uterus, leading to increased weight of the organ, straightening of the body, loss of its normal curvature, and, by the weight, displacement of the organ forward, by which pressure is exerted against the fundus of the bladder; or, again, the increased weight produced by inflam-

matory conditions causes relaxation of the pelvic ligaments and consequent displacement of the uterus downward and backward, while the body is bent upon the cervix. This bending may take place either forward, backward, or laterally.

3. The presence of inflammatory material in the cellular tissue and in the structures surrounding the uterus causes its displacement by the volume of exudation, and subsequent displacement in the opposite direction takes place by the resulting inflammatory contraction. The uterus may be displaced as a whole, while its axis still remains parallel to what it was before, causing a change of location; or, again, it may

Fig. 328.—Uterovaginal Prolapse.

be turned upon its axis forward, backward, or laterally; may be bent upon its own axis; may be depressed downward; and may undergo torsion.

4. The presence of growths, either of uterine or external origin.

410. Classification of Displacements.—As may readily be inferred from what has been stated in the previous section, the uterus is capable of displacement upward, downward, backward, forward, and laterally, and of being twisted upon its axis. Upward displacement is known as ascent; downward,

as descensus or prolapsus uteri. (Fig. 326.) The location of the uterus is subject to change: thus, when it is situated toward the back part of the pelvis, hugging closely the hollow of the sacrum, it is known as a retrolocation; close to the symphysis pubis, as an antelocation; and toward one or the other side of the pelvis, as a dextro- or sinistro-location, according to the side on which it is situated. When the direction of the axis of the organ is changed, it is known as a version; with the fundus well forward, it is an anteversion; the fundus turned backward, a retroversion; and toward either one or the other side,

Fig. 329.—Vagino-uterine Prolapsus.

a dextro- or sinistro-version. The organ may be bent upon its axis, in which event the cervix and fundus approach each other. This bending may take place forward, backward, or laterally, giving rise to the terms anteflexion, retroflexion, and dextro- and sinistro-flexion. Finally, it may be twisted upon itself, producing a torsion.

411. **Ascent** is the least frequent form of displacement. Those conditions which increase the weight of the organ, naturally by force of gravity, depress it. It is only when the organ has attained a size so great that it is no longer accommodated

within the pelvis that ascent occurs. This is recognized as a physiologic ascent in pregnancy, and occurs after the fourth month, when the uterus becomes so large that it can no longer be retained within the pelvis, and rests upon the brim. A similar state develops when fibroid growths are situated in the organ and become large. (Fig. 327.) The uterus is drawn or pushed up by growths which may have developed in the pelvis and become adherent to it. As they increase in size and rise out of the pelvis, they drag or push the uterus up with them. Ovarian tumors, extra-uterine pregnancy, extensive pel-

Fig. 330.—Vagino-uterine Prolapsus with Hypertrophic Elongation of the Cervix.

vic exudation, hematocele, and retro-uterine growths may bring about an elevation of the uterus.

412. Diagnosis.—The elevation of the uterus is readily determined by digital examination. The cervix is absent from its usual position in the vagina; frequently so elevated as to be with difficulty reached behind or even above the symphysis; often a growth or mass fills the pelvis, over which the cervix can not be reached. Greater difficulty is sometimes experienced in determining the condition which has caused the displacement, and this is more important than the treat-

ment, for the latter is entirely dependent upon the cause producing the displacement.

413. Descent, or Prolapsus.—Descent or prolapsus of the uterus varies in degree. By this term is understood a downward displacement of the organ, which is generally associated with retroversion, so that retroversion is often considered as the first degree of prolapsus. The uterus is situated at a lower level, with the os directed in the axis of the vagina. The second degree of prolapsus is when a portion of the organ protrudes through the vulvar orifice, and the third degree when the entire uterus is outside of the vulva. This term includes a partial or complete prolapsus or inversion of the vagina. Prolapsus is also divided into complete and incomplete, according to the situation of the uterus. When the organ is still situated within the vagina or only a portion protrudes from the vulva, it is known as incomplete prolapsus, but when the entire uterus is external to the vulva, it is called a complete prolapsus. The term procidentia is also applied to prolapsus, but only when the entire uterus is external. Prolapsus is further divided into three varieties, according to the relation of the uterus to the vagina. Thus, it is called uterovaginal prolapsus (Fig. 328) when the prolapsus begins in the uterus, which is extruded through the vagina with only partial inversion of the latter; (2) vaginouterine prolapsus when the prolapsus begins in the vaginal walls and more or less extensive protrusion of the vagina precedes the prolapse of the uterus (Figs. 329 and 332). In such cases the prolapsus of the uterus may be incomplete, while the vagina is inverted, and a hypertrophic elongation of the cervix exists (Figs. 330 and 331). The third variety is pseudo-prolapsus.

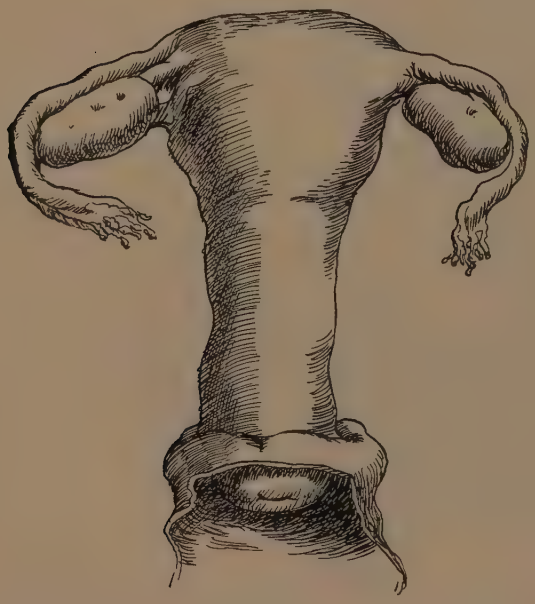


Fig. 331.—Uterus Detached, Showing Hypertrophic Elongation of the Cervix.

In this condition a large portion of the cervix projects into or through the vulva, while the fundus retains its normal position and the vaginal walls are unaffected (Figs. 333 and 334). In the latter case the hypertrophic elongation takes place in the vaginal portion of the cervix.

414. Etiology.—The causes of prolapsus may be classified under three heads: first, decreased support; second, increased weight; third, increased intra-abdominal pressure. These conditions can exert their influence separately, but they usually act in conjunction. Decreased support is characteristic of individuals who have given birth to one or more children, and in whom the pelvic structures have been injured during the process of parturition. Laceration of the perineum or removal of the support of the posterior segment of the pelvic floor permits a protrusion of the anterior wall of the vagina and the bladder during the distention of the latter organ. This protrusion of the anterior segment of the pelvic floor, because of the close attachment of the bladder to the cervix, drags upon the latter, and, unless the uterus is fixed by firm ligaments or inflammatory adhesions, the entire organ is gradually brought into the axis of the vagina, with its fundus thrown backward, and the intra-abdominal pressure will subsequently be directed upon it or its anterior surface. The decreased support to the posterior wall of the vagina permits protrusion of this segment with the rectum, and the cervix is drawn upon by both the anterior and posterior vaginal walls. Decreased support may exist in women who have not given birth to children, where, owing to want of normal muscular development, to ill health or to too straight a sacrum, the support is lessened, and the muscles of the pelvic floor are

Fig. 332.—Vulvar Appearance of Vaginouterine Prolapsus.

greatly relaxed. If, in such cases, intra-abdominal pressure is increased, extensive displacement results. Prolapsus may thus be produced in the unmarried. In marked relaxation and want of pelvic support, which has resulted from lesions of parturition, the tendency to prolapse is increased by enlargement of the uterus or by failure to complete the process of involution. The uterus remains heavy, so that these two forces, decreased support and increased weight, acting in conjunction, lead to descent. It is true, we may have prolapsus when the uterus is small; thus, in cases in which, subsequent to the climacteric, the patient loses

Fig. 333.—Pseudoprolapsus. Cervix within the Vagina.

flesh, the absorption of the fatty cushion decreases the amount of support, and, with enfeebled muscular action, permits a small uterus to be driven through the pelvis. This is a cause of prolapsus in the aged. Increased intra-abdominal pressure may arise from want of hygiene in clothing, where tight corsets and heavy skirts fastened about the waist afford insufficient room in the abdomen for the viscera, which are driven downward into the pelvis. Neglect of the evacuation of the bowels and of the bladder increases the tendency to displacements. Prolapsus is

favored by straining at stool, by lifting and carrying heavy weights. Not infrequently a patient will give a history of having lifted a weight, or of violent straining, after which a protrusion was noticed at the vulvar orifice. In such cases the condition has existed for some time, and in the majority has been aggravated only at the time of the extra effort. The presence of growths within the abdominal cavity—fibroid tumors, ovarian cysts—which press upon the uterus may force it down. In relaxation of the pelvic floor it is not unusual to observe a prolapsus of the uterus, which has been produced by the increased intra-abdominal pressure incident to the presence of a new growth.

Fig. 334.—Pseudoprolapsus. Cervix Protruding from Vulva.

415. Symptoms.—In the early stages of prolapsus of the uterus there are no symptoms characteristic of the condition. The patient complains of a sensation of weight, pressure, discomfort in the bladder, a feeling of burning in the rectum and dragging sensation while walking or standing—all of which may be associated with other conditions. As the prolapsus progresses, the patient will notice a protrusion from the vulvar orifice, which is increased by straining and lifting. As this protrusion increases, the close association of the bladder with the cervical wall causes the uterus to be dragged down. The bladder

with exceedingly rare exceptions accompanies the displacement. Occasionally, however, the peritoneal fold may be driven down between the bladder and the uterus, and a prolapsus thus occur without the bladder being associated with it. With the continuation of the prolapse the anterior wall becomes more and more everted and, not infrequently, forms a considerable-sized tumor, which projects anteriorly, is increased by straining, and forms a tumor with a smooth, globular surface. This protrusion of the anterior wall of the vagina and bladder is known as a cystocele. (Fig. 335.) The posterior wall of the vagina may be likewise protruded, though less frequently than the anterior. In cases of inversion of the vagina the posterior wall is generally associated, although even then not to the same degree as the anterior (Fig. 335). The posterior protrusion is known as a rectocele. The uterus is separated from the rectum by a prolongation of the peritoneum which extends below the rectum on the posterior wall of the vagina. In the inversion of the posterior wall of the vagina to form a rectocele, the intestine may or may not be associated with it. Occasionally, the want of support of the anterior rectal wall permits it to be pushed downward, and form a diverticulum considerably below the anus, which renders the evacuation of the bowel difficult, and at times impossible, unless it is pushed up with the hand, when the scybalous masses situated in the pouch can be extruded. In complete prolapsus of the vagina with the formation of an extensive cystocele a portion of the bladder is situated below the level of the internal orifice of the urethra, and as this protrusion extends, the bladder is incompletely evacuated, the retained urine with mucus in this reservoir undergoes

Fig. 335.—Anterior and Posterior Colpocele.

decomposition, forming an ammoniacal urine, which irritates the mucous membrane of the bladder and produces a cystitis. In this diverticulum, with a plug of mucus as a nucleus, a calculus of considerable size can form; indeed, one weighing an ounce has been found in such a sulcus. With the protrusion the distress of the patient is greatly increased, because of

Fig. 336.—Cystocele.

the bladder irritation and the friction of the protruding tumor against the clothing and limbs of the patient. The urethra, instead of passing upward and backward as in the normal situation, passes backward, and even downward. The protruded vagina in a complete prolapsus may form a large tumor extending half way to the knees, in which tumor is situated a

portion of the bladder, the uterus, ovaries, tubes, and prolapsed intestines —an extensive hernia (Fig. 338). The mucous membrane of the vagina loses its moistened, reddish appearance, and instead becomes pale, thickened, and covered with flakes of epithelium, and resembles the appearance of the skin. Bathed with urine and fecal matter, irritated by the clothing and by friction against the limbs, and congested from the decubitus, ulceration is produced upon the external os and upon the sides

Fig. 337.—Prolapsus with Both Rectocele and Cystocele.

of the tumor, which, at times, causes extensive ulceration and adds greatly to the discomfort of the patient. In the early stage of the displacement the menses are increased, possibly irregular, and occur at shorter intervals. Leukorrheal discharge is present, often profuse, as a result of the congestion of the organ. As the prolapsus becomes still more extensive, and approaches nearer to complete prolapsus, menstruation is likely to be decreased and the leukorrheal discharge disappears. The displacement does

not necessarily interfere with conception, as pregnancy has often occurred with complete prolapsus; but in the later stages the patient is more likely to be sterile.

416. Diagnosis.—The patient considers every protrusion from the vulva to be a prolapsus or falling of the womb. The diagnosis would seem self-evident, but it must be conceded that not every such protrusion is necessarily a prolapse of the uterus, and it is important to determine the degree, the form of prolapsus, and the structures involved. This knowledge is obtained by inspection, while the patient is directed to increase the displacement by straining and bearing down, and is further confirmed by touch. A protrusion from the

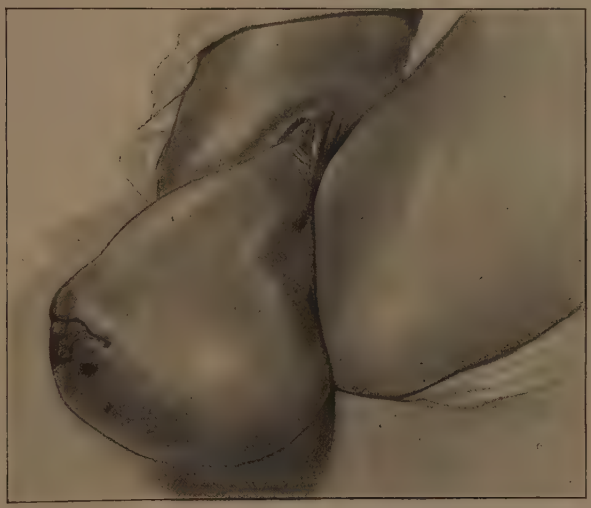


Fig. 338.—Irreducible Prolapsus. The Tumor Contained Uterus and a Large Pyosalpinx. Ulceration of Cervix.

anterior part of the vulva which, on separating the labia, is found to be continuous with the urethra and anterior wall, is a cystocele. It is the most frequent protrusion from the vulva, and may be accompanied in part or wholly by the uterus. Cystocele is recognized by the finger entering the vagina behind the protruding mass, which can generally be replaced with ease. The cervix, when accompanying it, will be situated at its posterior surface. A protrusion of the posterior wall of the vagina is recognized by its continuity with the perineum, and the finger enters the vagina in front of it. Considerable protrusion of the vaginal walls occurs without much, if any, displacement of the uterus. The degree of displace-

ment of the anterior and posterior walls of the vagina is recognized by the introduction of the finger around the uterus. Thus, the cervix can protrude from the vulva without there being any shortening of the posterior, and but slight shortening of the anterior, wall of the vagina. With inversion, or complete prolapse of the vagina (Fig. 337), the summit of the protrusion is occupied by the cervix, which can appear as the normal-sized opening, or external os; or, when laceration of the cervix has occurred, the lips may be widely everted, and show an irritated cervical mucous membrane. When prolapsus is complete, the uterus is situated in the tumor, external to the vulva, generally in the position of retroversion or retroflexion; rarely it is anteflexed. The uterovaginal form of prolapsus is determined from the vagino-uterine variety by the lessened involvement or association of the vagina with the protrusion. In the uterovaginal form (Fig. 339) the uterus is driven through the vagina, drags with it the upper part, and finally results in partial inversion of the canal. When the prolapsus is complete, the uterus is likely to be small and its cavity short. In the vagino-uterine variety the prolapse begins at the lower segment of the vagina by a rolling outward of the anterior and posterior walls. The thickened and everted vaginal walls drag upon the cervix, and lead to displacement of the uterus; or, where the fundus is fixed by the condition of its ligaments or by inflammatory disorders, the cervix is drawn out, and causes a very marked elongation of the uterus. This condition is determined by placing the fingers of one hand

Fig. 339.—Prolapsus without Protrusion of Vaginal Walls.

in front of, and those of the other hand behind, the protruding mass, when we determine the situation of the fundus of the uterus. (Fig. 340.) The protruding tumor can be grasped between the thumb and fingers of one hand, when the fingers will distinguish the uterus outside the vulva, or the cord-like cervix protruding into the vagina, when hypertrophic elongation of the cervix exists (Fig. 341). The situation of the fundus can still further be recognized by the introduction of the finger into the rectum. By dragging upon the cervix with a tenaculum while passing the finger into the rectum the at-

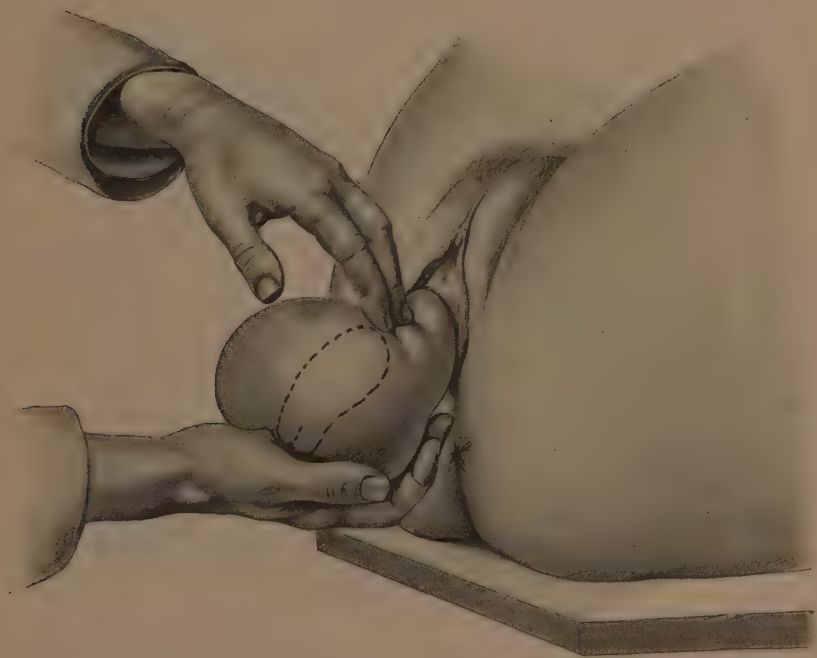


Fig. 340.—Determination of the Position of the Uterus by Bimanual Palpation.

tenuation of the neck is determined, and the situation of the fundus is recognized (Fig. 342). In pseudoprolapsus the fundus is but little displaced from its normal situation. There is a protruding mass from the vulvar orifice, and the introduction of the finger into the vagina shows that the vaginal walls are not displaced; this elongation has taken place in that portion of the cervix which is situated below the vaginal attachments. It generally results from enlargement and increased weight of the cervix. The anterior segment of the vagina is attached to the cervix at a lower level than the posterior. Occasionally,

we find a protrusion of the anterior wall of the vagina, and at its posterior surface the cervix, while the introduction of the finger into the vagina shows that the posterior vaginal wall is not displaced (Fig. 343). In other words, the elongation has occurred in that portion of the cervix situated between the attachment of the anterior and the posterior walls.

In considering the differential diagnosis we must concede the possibility of the protrusion having arisen from a cyst in the anterior wall of the vagina, a hernial protrusion through the posterior fornix, a fibroid polypus, and an inversion of the uterus, associated with inversion of the vagina. Cyst of the

Fig. 341.—Recognition of Uterus with Thumb and Fingers of One Hand.

vagina is recognized by bimanual palpation. A catheter or sound is introduced into the bladder, and a finger into the vagina, by which the abnormal thickness of the anterior wall is readily recognized and the character of the condition disclosed. The bimanual examination can reveal a fibroid polypus protruding from the orifice of the cervix by a more or less distinct pedicle. Traction upon the tumor and the introduction of a finger into the rectum will disclose the position above of the uterus. Displacement of the rectum is not generally associated with prolapsus of the vaginal walls, and, when so, is less intimately connected. Inversion of the uterus is recognized by a pro-

truding tumor, which does not present an external os, is more sensitive, under careful examination shows the orifices of the Fallopian tubes, and is a globular, well-shaped tumor, which can, still further, lead to an inversion of the vagina in which the relation of the cervix to the tumor and the vagina is readily determined.

Enterocele, or hernia through the posterior fornix of the vagina, is a rare condition, although I have seen two such cases in which the hernia extended to the vulva (Fig. 344). The

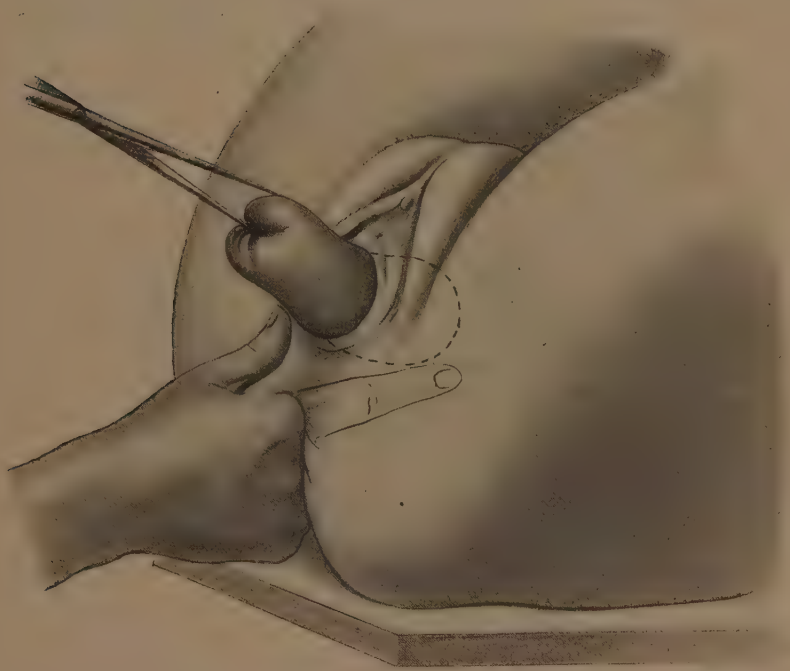


Fig. 342.—Diagnosis of Position of the Uterine Body by Rectal Touch.

tumor is generally more elastic and is greatly distended. The absence of the uterus, in association with it, is recognized. On reduction of the hernia the opening into the posterior fornix, through which it had passed, is readily recognized.

417. Prognosis.—The results of treatment must generally depend upon the stage of development, the existing complications, and the manner of life the patient is required to live. The earlier the displacement comes under observation, the less radical will be the means required to maintain the organ in its replaced position. When both uterus and vagina are

prolapsed, changes have taken place which are beyond our skill to restore to the previous condition. While much can be done for the comfort of the patient in all cases, still in some, however, it may be necessary to sacrifice the uterus and part of the vagina. The irritation to which the vagina is subjected will sometimes lead to the development of an epithelioma (Fig. 345). Not infrequently we will find gravity sores and extensive ulcerations as a result of friction and the interference with the circulation. The restoration and maintenance of the pelvic organs in their proper place will depend upon the

Fig. 343.—Hypertrophic Elongation of the Cervix. Anterior Vagina Everted, while Posterior Retains Its Normal Position.

complications which may be associated with the displacements. The most frequent complication is the sequel of inflammatory changes, in which the displaced organs are more or less fixed by extensive exudation and adhesions. In procidentia the protruding sac or hernia, in addition to the uterus and part of the bladder, is likely to contain the ovaries and tubes, and even a large portion of the large and small intestines. Inflammatory changes in such a condition may lead to an irreducible hernia, which must necessarily add very much to the distress and discomfort of the patient. Such a patient can neither sit nor stand with comfort. In one patient (see

Fig. 338) a large protruding sac contained the uterus, ovaries, and tubes, the latter having become infected, and resulted in the formation of a quite considerable-sized abscess. Fortunately, the condition was irreducible, for otherwise the reduction of such a mass into the abdominal cavity might readily have resulted in rupture of the tube and general infection of the peritoneum. In one instance I was obliged to remove the uterus because of a partial necrosis of its structure. Ordinarily, hysterectomy would not be the operation of election, as the removal of the uterus leaves an open space, which it is difficult to thoroughly close, and favors the subsequent development of a vaginal hernia, which is difficult to remedy. With

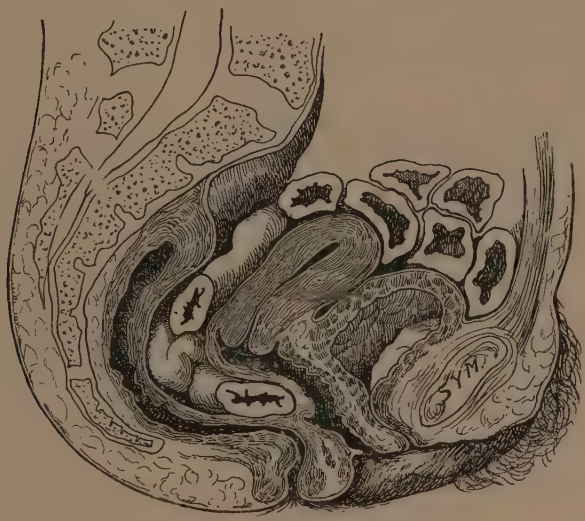


Fig. 344.—Enterocele through the Posterior Vaginal Fornix.

the retention of the uterus and its proper anchorage in the pelvis, it serves as a plug and obstruction to the re-development of a hernia. It is self-evident that the patient who is enabled to live a luxurious life need not be subjected to the same treatment as the woman who must maintain herself, and, possibly, the members of her family, by laborious industry. The former by rest and proper hygiene may be able to prevent the development of the prolapsus, consequently an operative procedure may be delayed or mechanical means employed to overcome the condition, while the woman who must earn her living at the washtub or by continuous maintenance of the upright position will be required to subject herself to operative interference in order to prevent a more extensive displacement.

418. Treatment.—The treatment of prolapsus uteri must necessarily depend upon the extent of the displacement, the involvement of the vagina, the distention of the vaginal orifice, and the age and physical condition of the patient. The most important treatment is prophylaxis. This consists in the careful management of the woman during labor and the puerperium; the early repair of lacerations of the cervix and perineum; the examination of the patient subsequent to her delivery to determine the condition and situation of the uterus. The advent of inflammatory conditions should be followed by careful rest and judicious treatment; the employment of hot vaginal douches; cold applications over the abdomen; rest in bed; depletion of the uterus; and, where endometritis exists, the use of the curet. A heavy uterus should be sustained by tampons

Fig. 345.—Vagino-uterine Prolapse Complicated by Proliferating Epithelioma.

or a pessary, until the process of involution has been completed. The treatment of prolapsus may be divided into hygienic, mechanical, and operative. Hygienic treatment comprises the wearing of proper clothing. A woman with a tendency to prolapsus of the uterus should not wear tight clothing. The increase of the intra-abdominal pressure necessarily aggravates the displacement; consequently, the clothing should be loose. Skirts should be suspended from the shoulders rather than about the waist; the bowels should be kept regular and all straining at stool avoided; lifting and carrying heavy weights should not be undertaken; the patient should frequently assume the knee-chest position, and while in this attitude, separate the vulva in order that the air may enter and magnify the influence of gravity in restoring the displaced organs. This position should be particularly assumed for several minutes

as a last act before retiring, and patients should assume the lateral or prone position rather than the recumbent.

Mechanical treatment of prolapsus consists: (1) in the reduction of the displaced uterus or its return to a normal position; (2) in the employment of means to insure that this position will be maintained. The first step, then, in treatment is to replace the displaced organs. Ordinarily this is not difficult, as the increased size of the vaginal canal readily permits the organ to be carried upward to its proper place. Where the displacement, however, is complicated by inflammation with extensive exudation into the pelvis, it may result in matting together the uterus, ovaries, and tubes with knuckles of intestine and portions of omentum. Such a condition will render the restoration of the organs exceedingly difficult, if not impossible, without resort to operative interference. Sometimes the displaced uterus, from passive congestion or edema, will become so large and engorged that it can not be replaced through the pelvic canal. This is particularly prone to occur in those cases in which the prolapse is complete and the uterus and vagina have been subjected to friction against the clothing, causing the formation of gravity sores, and swelling to such an extent that the mass is rendered too large to be returned through the pelvis. Such a tumor may sometimes be reduced in size by the application of an elastic bandage, or by keeping the patient perfectly quiet in bed, with the pelvis somewhat elevated, and cold applications applied to the swollen structures. Cloths wet with lead-water and laudanum and covered with oiled silk, over which an ice-bag is applied, will frequently be effective in relieving the engorgement, and after a few days' treatment will result in such a decrease in size as to permit the parts to be reduced. The organ can be replaced with much greater ease by placing the patient in the genupectoral position. While the patient is in this position, the tumor can be drawn down, compressed with the fingers, and gradually pushed up to its normal site within the pelvis. A mass too large to permit of its replacement with the patient in the dorsal position can generally be returned while in the knee-chest posture. When the uterus is fixed by inflammatory exudate, the patient should be put to bed, the parts subjected to pelvic massage, and in the intervals the uterus supported as high as possible by tampons of cotton and gauze, or, probably still better, lamb's wool saturated with medicinal agents, in which glycerin shall form an essential part. This treatment should be alternated with hot vaginal douches. Inflammatory adhesions may also be overcome by the employment of continuous weight or pressure. This is rather difficult to apply within the pelvis, because of

its being the most dependent portion of the trunk. The patient can be placed upon her side, with the pelvis somewhat elevated. Pressure is then obtained by introducing a small rubber bag, containing mercury, into the vagina. The continued pressure thus directed upon the surface will promote the absorption of the exudation, and, by change of position, the uterus can be gradually worked free from the exudate. Thus, tampons,

Fig. 346.—Ring Pessary.

Fig. 347.—Disc Pessary.

douches, massage, and pressure should be employed until the uterus becomes freely movable and its reposition accomplished. This, of course, is desirable as a preliminary to the employment of such a mechanical support as the pessary. In cases of prolapsus the pessary acts by so distending the upper part of the vagina that the levator ani and the muscles of the pelvic floor form a support for the instrument, and thus prevent the displacement. Consequently, it is necessary that

Fig. 348.—Smith-Hodge Pessary.

Fig. 349.—Munde Pessary.

the pessary shall be of sufficient size to accomplish this distention. The pessaries most frequently employed are the ring (Fig. 346), the bulb, the disc (Fig. 347), the Smith-Hodge (Fig. 348), or Thomas or Munde (Fig. 349) modification of the latter. Numerous other pessaries are employed, such as the soft-rubber pessaries (Fig. 350), the Zwank or bat-like pessary (Fig. 351), the Gehrung (Fig. 352), the double curved pessary, the saddle or Graily Hewitt (Fig. 353), according

to the purposes designed to be accomplished by their designers. In the employment of many of these pessaries, however, it is absolutely necessary that the pelvic floor shall afford a point of resistance to the intra-abdominal pressure. In cases in which the pelvic floor has been lost, or where the prolapsus is of the vagino-uterine variety, the pessary, having no point of resistance, is at once extruded when the patient makes a

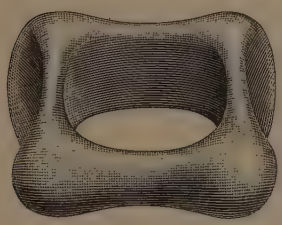


Fig. 350.—Hoffman Soft-rubber Pessary.

Fig. 351.—Zwank Pessary.

straining effort, or even upon standing. In such cases a pessary may be employed with an external support. This is in the form of a cup with a stem attached to straps which are fastened to a belt around the waist. Such an instrument, however, is exceedingly uncomfortable; the stem and straps are irritating to the delicate external surfaces. The cup may cause ulceration and abrasion of the cervix and vagina. The employment

Fig. 352.—Gehrung Pessary.

Fig. 353.—Hewitt Cradle Pessary.

of a pessary in prolapsus can only be palliative; it has no power of restoring the function of the part. However, a patient came under my observation who had worn a pessary for twenty-six years. This had produced such marked abrasion and irritation of the vagina that granulations had sprung up which enveloped the greater part of the instrument with new tissue. The pessary was cut with bone pliers, and each half removed

separately, leaving undisturbed the mass of cicatricial tissue by which the uterus was subsequently supported. I have seen, in several instances, the bulb or glass-ball pessary worn for a long period of time, until it resulted in cicatricial changes in the vagina, which formed the support for the atrophied uterus. The maintenance of the uterus by the establishment of cicatricial tissue has been attempted by the injection of quinin and other irritating materials into the broad ligaments. This was done in order to establish a cellular inflammation, which should cause such contraction of the connective tissue as to retain the uterus in position. Such a plan of treatment, however, is attended with too much danger to justify its employment.

The operative treatment is the only procedure which can be considered radical, or affording hope for the restoration of the structures and their maintenance in normal position. In the employment of such measures I wish to direct your attention to the three causes which have been assigned for the development of prolapsus. These are, increased weight of the uterus, decreased pelvic support, and increased intra-abdominal pressure. The malposed uterus is rendered heavy by a condition of subinvolution or chronic inflammation, which has in part resulted from obstruction to its circulation. Not infrequently will we find that the cervix has undergone hypertrophic elongation, and that the vaginal walls are dragging upon this elongated portion of the organ. The first step, then, in the restorative process, should be the amputation of the cervix. This decreases the size of the uterus, not only by the amount of the cervix removed, but by the favorable metabolism thus engendered. The amputation may be free or the double-flap or single-flap method can be employed (see Amputation of Cervix, p. 218), according to the particular pathologic condition present. In performing this operation, we would suggest that the cervix be sutured with chromic catgut, as such sutures can be allowed to remain; moreover, the stretching of the newly united surfaces, consequent upon the removal of sutures of other denomination, is avoided. The second indication is met by narrowing the vaginal canal and reconstructing the pelvic floor. Early in the history of gynecology various operations were devised to secure this object. Sims did a triangular denudation upon the anterior wall, the surfaces of which were united and the canal thus reconstructed. The method of freshening the surface will largely depend upon the character and form of the prolapsus. The protrusion of the anterior wall of the vagina, for which these procedures are considered, is known as cystocele. Furthermore, the maintenance of the uterus in position by narrowing the vagina will be especially

applicable to the correction of the cystocele. In cystocele we have to deal not only with the protrusion of the vaginal wall, but also with an accompanying prolapse of the bladder; a portion of the bladder is consequently oftentimes below the level of the internal orifice of the urethra. The portion thus displaced, as we have seen, affords an opportunity for ammoniacal fermentation and decomposition of the urine. In the sulcus or depression thus formed, not infrequently calculi are devel-

Fig. 354.—Anterior Colporrhaphy. Anterior Vaginal Wall Removed.

oped, which further aggravate and add to the distress of the patient. Any operative procedure, then, should comprise not only the contraction of the anterior vaginal wall, but the elevation of the bladder to a higher level. This change of the bladder position is accomplished by an incision through the anterior vaginal wall into the connective tissue between the vaginal and vesical surfaces. The edges of this incision are held with forceps, while, by blunt dissection or with suc-

cessive snips of the scissors, the vesical surface is dissected off; this dissection is extended upon either side to a degree sufficient to permit the removal of the relaxed tissue of the anterior vaginal wall. The bladder should then be pushed away from the cervix, up to or even through the peritoneum (Fig. 354). This dissection is followed by tucking the bladder up from below, and stitching it fast to the cervix at a higher level. This method renders the posterior surface of the bladder more tense. Some operators have advocated anchoring the bladder to the anterior parietes through an abdominal incision, but such a procedure will be necessary in but few cases. The traction upon the bladder and its fixation to the anterior surface of the uterus will decrease the pressure against the reconstructed vaginal walls. The vaginal incision should be united from near the cervix, and the suturing extend outward, the cervix being pushed as we proceed. In this manner a strong anterior segment of the pelvic floor is established (Fig. 355). The suturing should be done in a vertical line with a continuous chromic catgut suture, which should be locked at every second turn, in order to prevent puckering of the wound. The aim of the operator should be to make a long anterior wall, to hold the cervix backward, and, consequently, tilt the fundus uteri forward. In greatly relaxed vaginal walls the excision may be made circular, and the wound closed with the Stolz suture (Fig. 356). This, however, contracts the vagina in every direction and, therefore, is less favorable in the majority of

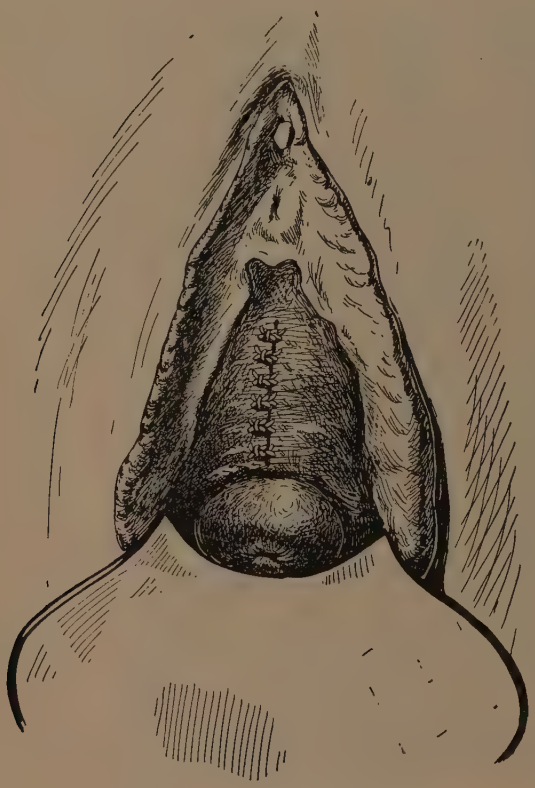


Fig. 355.—Wound Closed.

cases than the method of anterior colporrhaphy, already described. The ordinary method of performing the operation, known as anterior colporrhaphy, consists in making a denudation which does not penetrate the entire vaginal wall. When sutured, such a denudation forms a wall of connective tissue, which is not so durable as the method we have described. The operation upon the anterior vaginal wall should be supplemented by one upon the posterior. This may be slight or extensive,

Fig. 356.—Stoltz's Purse-string Suture.

according to the amount of relaxation. The restoration of the posterior segment may be accomplished by performing the operation known as the modified Garrigues-Hegar, or the operation designed by Emmet. For a description of the method of performing these operations see page 256. The decrease in the size of the uterus, the restoration of the pelvic floor, as described, will, in some cases, prove effective in maintaining the uterus in its proper position. In others, however,

in which the uterus is large and does not maintain its proper axis, but drops backward, the intra-abdominal pressure will tend to drive it through the newly united canal and reestablish the hernia. It is consequently important that the uterus should be anchored within the abdomen, to prevent such an occurrence. This anchoring of the uterus may be accomplished by the operation known as ventrosuspension, or, still better, ventrofixation. For the description of this operation and its indications and contraindications see page 491. The same purpose can be effected by one of the operative procedures which utilize the round ligaments, as, the Alexander, the Gilliam-Ferguson, the Ries, or other modifications, which will be described later. The aim, of course, of the operative procedure is to maintain the fundus of the uterus forward. This can be accomplished by vagino-uterine fixation, or by shortening the round ligaments through the vagina. These operations can readily be done in association with those upon the anterior wall of the vagina, as in the procedure we have already described. When the bladder is pushed away from the cervix, it is very easy to enter the peritoneal cavity through an anterior colpotomy and employ the opportunity thus afforded to break up adhesions, to treat ovarian and tubal disease, and to restore the uterus to its normal position. The incision through the posterior vaginal fornix is also employed for shortening the uterosacral ligaments. It will readily be understood that if the cervix is carried upward and backward, the fundus will necessarily fall forward. The contraction of the uterosacral ligaments, or the tissue in which they are usually situated, is of special value in marked prolapsus, for if the ventrosuspension or fixation, or one of the operations upon the round ligaments alone is done, we would have the uterus hanging and dragging upon its anchorage. Shortening the uterosacral ligaments, however, lifts up the cervix and, consequently, throws forward the fundus, thus making the uterus serve as a plug to obstruct the egress through the pelvis. Freund advised in aged women, in whom the prolapsus was marked, and the condition of the patient unfavorable for a radical operation, that silver wire sutures should be passed so as to form successive rings beneath the uterus. The introduction of the sutures should begin immediately beneath the cervix, so as to push up and maintain the organ at a higher level. He directed that they be drawn moderately tight and fixed by twisting, the ends are then cut off and pushed into the vesicovaginal septum. The silver wire thus secured forms successive bands or hoops around the restored vagina, which it was thought would maintain the uterus in place. My own experience, however, is that upon very slight exertion

the entire condition is reestablished. Moreover, the silver wire sutures are likely to cause irritation and possibly the formation of abscess, which will ultimately require their removal. In prolapsus of large uteri, complicated by inflammation of the tubes and ovaries, with bands of adhesion fixing omentum or coils of intestine to the uterus and bladder and with the subsequent cicatricial changes, the preferable plan of procedure, in my judgment, is the partial or complete removal of the organ. Even so radical a procedure should be supplemented by a plastic operation upon the vagina, in order to narrow the canal and afford better support to the abdominal viscera. Such patients, even though old, bear operation fairly well. Where the condition of the uterus will permit of its retention, the organ then should not be sacrificed. We have already cited reasons why hysterectomy should not be the operation of election. In hypertrophic elongation of the cervix it may be difficult, by simple amputation of the cervix and fixation of the uterus, to sufficiently elongate the vagina to prevent recurrence of the hernia. In such cases, especially where the woman has passed the climacteric, the supravaginal amputation of the fundus uteri, through an abdominal incision, followed by suturing the stump, covered with peritoneum, to the broad ligaments upon each side, as advocated by Baldy, will be effective, or, when the vagina is very much relaxed, we may sew the stump

Fig. 357.—First Stage of Dudley's Bilateral Denudation of the Vaginal Walls for Prolapsus.

of the cervix directly to the abdominal parietes, as advocated by Noble. E. C. Dudley asserts that the part of the vagina most resistant to displacement is its lateral surface, and that, instead of narrowing the vagina on the anterior and posterior walls, the preferable plan of procedure would be to denude an elliptical surface upon either lateral fornix, with the long diameter antero-posterior. The edges of newly made surfaces are apposed and secured with sutures through the long diameter. From this a lateral denudation is made upon either side, in which the sutures are introduced from behind forward and from above downward, in such a way as to lift up the anterior wall of the vagina (Figs. 357 and 358). Even in marked cases of prolapsus, sutures may be introduced so as to in some degree serve to anchor the lateral surfaces of the vagina.

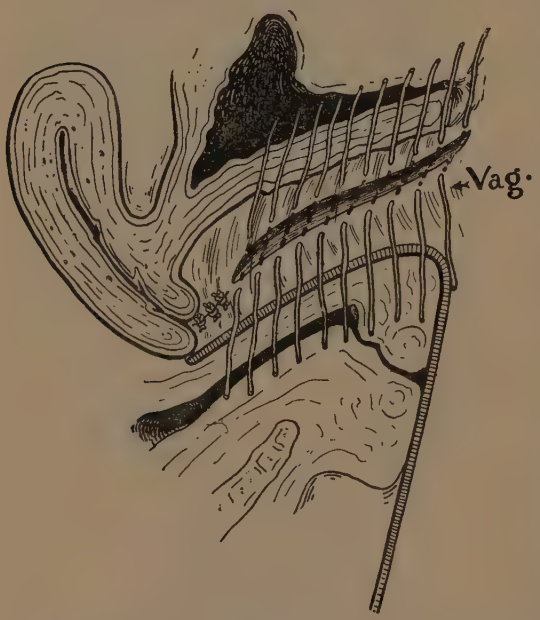


Fig. 358.—Dudley's Operation, showing Denudation upon One Side of the Vagina.

419. Urethrocele.—The urethra, in extensive cystocele, is generally, more or less involved. As has already been recognized, the intimate connection of the bladder and urethra with the anterior vaginal wall necessitated their association in any prolapsus of the latter structure. When a segment of the bladder is situated below the internal orifice of the urethra, the upper part of the urethra, as a consequence, becomes prolapsed. The lower segment of the urethra, however, generally retains its normal situation. Occasionally, we may have a protrusion from the central portion of the urethra, which forms a sac-like projection (Fig. 359), at the lower portion of the anterior wall of the vagina. This latter condition is independent of any uterine or vaginal displacement. This projection, on the introduction of a catheter, is found to be a part of the urethra. It is at times so large as to form a kind of diverticulum, over which

the urine flows, without entering it, or enters it only to a limited extent. Pressure over the urethrocele causes a discharge of quite profuse purulent material, although pus has not previously been found in the urine. The treatment consists in dissecting out the sac, a catheter having been previously introduced as a guide. The opening in the urethra is closed while the catheter is in place. The vaginal wall is then sutured over this wound, and the urine is subsequently evacuated through a permanent catheter for two or three days.

420. Dislocation of the uterus is a displacement in which there is but slight change in its axis. These dislocations may be forward, backward, or lateral. The organ is more or less fixed in the abnormal position by inflammatory changes, frequently in the form of inflammation of the cellular tissue. In *anteposition* the uterus is situated close to the symphysis, generally above it, and the condition is produced by growths or by accumulations in the pelvis which push up the uterus. The organ once fixed in the abnormal position, remains. In *retroposition* the uterus is situated at a lower level, and close to the hollow of the sacrum. It results from inflammatory changes which contract, and fix the organ; thus, a hematocele in its earlier stages may push the uterus forward into a state of anteposition, but later, as the collection becomes absorbed and organized, contractions occur which draw the organ backward. When the contraction involves the region of the folds of Douglas or the uterosacral ligaments, the fundus of the organ will be pushed forward, and an anteflexion will be established. It is only when the organ has previously been the seat of metritis and has become so rigid that it resists the tendency to flexion that it retains the retroposed position.

Fig. 359.—Urethrocele.

Lateral position, either right or left, is generally due to inflammation in the cellular tissue of the broad ligament. In the acute stage of inflammation the organ may be pushed to the side opposite to that on which the exudation occurs. As

the condition becomes chronic, the inflammatory material contracts, and the uterus is drawn to the affected side. These displacements cause no special symptoms. The symptoms, when present, are due to the complications or conditions which have produced the displacement and are a consequence of the displacement.

421. Diagnosis.—The situation of the displaced organ is recognized by bimanual examination. The fixed position and situation are usually sufficient to establish the diagnosis. In lateral displacement the organ is not in a median position, and on manipulation moves more readily toward the affected side. In a woman whose abdomen is very fat or the abdominal wall quite rigid, the posterior dislocation is often difficult to differentiate from retroversion. The introduction of the sound would afford information, but the advantage derived from determining the position is insufficient to compensate for the danger from its use. An assistant dragging upon the cervix with a tenaculum or vulsellum while either the vaginal or rectal bimanual is practised will generally afford a definite determination as to the character of the malposition.

422. Torsion.—Torsion is generally associated with either a retroposition or a lateral position, and is due to an irregular contraction of the portion of the broad ligament which has been subject to cellular inflammation. This contraction twists the uterus upon its axis, so that the cornua may be turned anteroposterior instead of being situated laterally. The entire uterus can be thus twisted, so that, upon inspection, the os, instead of being transverse, will present an oblique or nearly anteroposterior line. Torsion also results from the presence of growths in one or the other broad ligament or of an ovarian tumor to which the tube is adherent. As the tumor enlarges it drags upon the uterus and twists it. This lesion is frequently overlooked, and presents no symptoms of special importance. (Treatment, see page 497.)

423. Anteversion.—In anteversion, the uterus is found with its fundus forward and the cervix directed backward or upward and backward (Fig. 360). The organ may be fixed in the abnormal position by complications, such as inflammation, which may cause adhesions between the fundus and anterior parietal peritoneum, or more frequently in the cellular tissues about the uterus, the cervix, or in the uterosacral ligaments. An inflammatory process of the uterosacral ligaments with a normal uterus will produce flexion, but when the latter organ is stiffened by long-continued inflammation, it causes anteversion. The uterus is considerably increased in size; its walls are thickened and often rigid and firm. The normal

flexion has disappeared and the canal is perfectly straight. This position of the uterus is caused by increase of weight, and in severe versions the fundus will lie forward upon the bladder or against the symphysis, while the cervix may be directed upward and backward.

424. Etiology.—Any disorder which increases the weight of the uterus increases the tendency to an antedisplacement. When the uterus has been the site of previous inflammation, particularly a metritis, this displacement is necessarily an anteversion. Metritis, subinvolution of the uterus, pelvic cellu-

Fig. 360.—Anteversion of the Uterus.

litis, occurring in the posterior portion and in the utero-sacral ligaments; fibroid growths in the fundus; ovarian growths—all may cause this form of displacement.

425. Symptoms.—Anteversion presents no characteristic symptoms. The symptoms are those which are associated with the complication by which it is produced. The patient may complain of a sensation of distress, from pressure upon the bladder, of frequent micturition, and of pain or a dull ache over the region of the symphysis.

426. Diagnosis.—Anteversion is readily determined by bimanual palpation. The cervix is situated high posteriorly,

and often reached with some difficulty, while the uterine body can be traced forward and is found to rest upon the bladder. Not infrequently the fundus lies well against the symphysis. The situation of the fundus in the anterior portion of the abdomen, the absence of any angle in the uterus, and its size, weight, and more or less immobility, definitely differentiate it.

427. Treatment.—As we have already seen, anteversion is a symptom or sign rather than an actual disease. It is a development that arises as a natural consequence of increased weight of the uterus, and the treatment must necessarily be that which is applicable to the existing complication. The most common complication is inflammation, causing hypertrophy or hyperplasia of the uterus, an irritative infiltration and proliferation of the tissue element. The inflammatory condition may exist with or without adhesions. The treatment of the condition, then, in the great majority of cases, is that of existing inflammation—hot vaginal douches, tampons medicated with agents which are expected to exert an influence in decreasing the size of the uterus. This decrease can frequently be accomplished, to a considerable degree, by thoroughly dilating the uterine cavity with laminaria tents, and after their removal, swabbing the interior of the organ with tincture of iodin, a saturated solution of iodin crystals in 95 per cent. carbolic acid, or a saturated solution of iodoform in ether. Following such an application, the decrease in size of the uterus may still further be promoted by packing the organ with iodoform gauze and by placing a tampon of iodoform gauze beneath it. This raises the organ to a higher level and promotes its circulation. Furthermore, the uterus can be dilated with graduated bougies, its cavity cureted, and applications made as suggested. Where the uterus is free from adhesions, it may be supported by a pessary. The pessaries which were devised for the purpose of elevating the fundus have not proved satisfactory. The retroversion pessary in some cases of heavy uteri is particularly serviceable, although it may seem a paradoxical instrument to employ in anteversion, but it does, however, afford relief by holding the uterus at a higher level. Operations upon the cervix, amputation, or the repair of a laceration of the cervix will establish a process of metabolism which will decrease the size of the uterus. When the uterosacral ligaments have not become shortened through inflammatory processes and thus caused an irremediable displacement, the operation devised by Sims may be practised. This consists in making a transverse denudation upon the anterior lip, another upon the vaginal wall at a suitable distance from it, and uniting these two surfaces by sutures (see Fig. 361). As a result of this operation,

the cervix is drawn toward the vulvar outlet, the fundus is tilted upward, and a more correct position is secured. When the uterus is fixed by adhesions, in addition to the treatment already suggested, pelvic massage will prove beneficial. Two fingers in the vagina are hooked behind the cervix and press the fundus of the organ upward; while the external hand is rotated over the fundus, the fingers pressing down along its sides and in front of it, push the fundus backward. While the fundus is pushed backward with the fingers of the external hand and drawn forward with the fingers in the vagina, bands of adhesion are put upon the stretch and are manipulated to such an extent that their absorption is promoted. The manipulation of the uterus promotes absorption of inflammatory exudate within its walls, and thus assists in decreasing its size, so that by the time the adhesions are stretched and loosened, the uterus is so reduced in size that the patient is much relieved. In some cases, where a boring pain is experienced over the symphysis, the wearing of a cincture or belt (Fig. 362) will support the abdominal viscera and relieve the intra-abdominal pressure to such a degree that the ache or discomfort will disappear.

Fig. 361.—Sims' Operation for Anteversion.

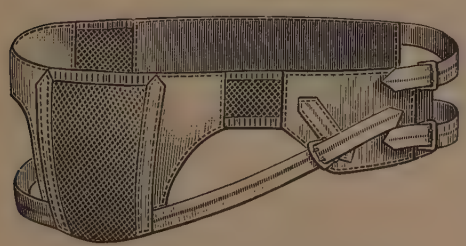


Fig. 362.—Abdominal Belt.

428. Retroversion. — In retroversion the uterus is turned with the fundus backward.

(Fig. 363.) The cervix is directed forward against the posterior wall of the bladder. This displacement varies in degree according to the relations of the cervix and uterus to the axis of the vagina. The maximum degree is a backward displacement in which the fundus lies low in the hollow of the sacrum, with the cervix directed upward. Retroversion is recognized as an early stage of prolapsus. With this displacement the intra-abdominal pressure is directed upon the fundus or upon the anterior wall of the uterus, which favors downward displace-

Fig. 363.—Retroversion.

ment, so that we usually find retroversion associated with a certain amount of descent of the uterus.

429. Etiology.—The most frequent cause of retroversion is a lesion of pregnancy. Retroversion occurs in the unmarried or sterile woman, but much less frequently. It is produced by decreased support of the ligaments, particularly of the uterosacral, which permits the uterus to sag downward and to be rotated backward; the latter action is occasioned by a distended bladder, until finally the ligaments lose their muscular tone and the organ does not regain its normal position. Retroversion can be produced by traumatism, as when the person falls from a height and strikes upon the feet or, par-

ticularly, upon the buttocks, and by the presence of growths in the uterus or in the ovaries.

430. Symptoms.—Retroversion causes few symptoms. The discomfort in the majority of cases arises from complications. Patients may have marked retroversion without experiencing any inconvenience or being aware of the condition until it is brought to their knowledge. Inflammatory complications produce a sensation of weight or dragging, as if everything were about to protrude when the patient stands or walks. The menstrual flow is increased, producing menorrhagia; occasionally, there is an irregular, bloody discharge, or the intermenstrual intervals are shortened, or, as a result of the coexisting catarrh, the patient will have a profuse leukorrhea. The projection backward of the fundus and pressure of the cervix against the bladder cause a more or less frequent desire to urinate. Not infrequently there is an extension of the inflammation to the vesical mucous membrane, which produces cystitis. Pressure of the uterus upon the rectum increases the tendency to constipation, interferes with the rectal circulation, and develops hemorrhoids and fissure of the anus. An injury of the anus or rectum under these circumstances is slow to recover, which makes it important, in cases of rectal disease, to ascertain the condition of the uterus before we resort to any operative interference.

431. Diagnosis.—Digital examination discloses the cervix uteri in the axis of the vagina, or looking forward and sometimes upward. Through the posterior vaginal fornix, the examining finger recognizes a mass which is continuous on a straight line with the cervix. The bimanual examination discloses the absence of the fundus from the anterior fornix. The rectal bimanual affords an opportunity to explore the fundus and even the anterior surface of the uterus. (For treatment, see Retroflexion, Section 442.)

432. Lateral Version.—Lateral version is a form of displacement in which the fundus is situated to one side of the pelvis, while the cervix is directed toward the other. This condition is produced by cellulitis in the broad ligament, and by intraligamentary growths, either fibroid or ovarian; in marked cases of inflammation contraction can occur in the base of one broad ligament, and in its upper part on the opposite side. This produces a fixation of the uterus directly transverse to the pelvis, not unusually with a certain amount of torsion. The lateral version causes no special symptoms, and is readily recognized by a bimanual palpation.

433. Anteflexion.—In anteflexion the uterus is bent upon its axis, with the fundus forward, while the cervix lies more

or less in the axis of the vagina. The flexion may be slight (Fig. 364)—but little more than normal; indeed, any flexion which is fixed is an abnormal one, even though it may not be greater than the ordinary bending of the uterus. From a slight flexion we may have a very acute one (Fig. 365), in which the fundus and cervix seem to lie upon each other at a very acute angle. The anterior wall of the uterus, at the point of flexion, undergoes a change in which there is a substitution of fibrous tissue for the muscle-wall. The posterior surface becomes exceedingly thinned where it bends over the anterior. (Fig.

Fig. 364.—Slight Degree of Anteflexion.

368.) The anteflexion may be mobile or immobile. The former results from a heavy fundus when the cervix is in a more or less fixed position. Raising the fundus, we can tilt it backward, and leave the uterus in a position of retroflexion, so that at times the organ is anteflexed; at others, retroflexed. Not infrequently a diagnosis of anteflexion will be made, and at a subsequent examination by another person the uterus is found retroflexed. If the fact that the organ is mobile is not remembered, an error in diagnosis will be attributed to the first investigator. In the immobile uterus the flexion is fixed. Ante-

flexion, again, may be regarded as physiologic, pathologic, and indifferent. A physiologic anteflexion is one which corresponds to the normal condition of the uterus; a pathologic, one in which the flexion is more or less fixed or is greater than normal; while in an indifferent anteflexion the bending causes no symptoms.

434. Etiology.—Anteflexion is probably next to the most frequent form of uterine displacement, and it occurs less frequently in the married than do the retrodisplacements. It occurs with greater frequency in the unmarried or nulliparous

Fig. 365.—Acute Anteflexion.

woman, and is a result of congenital conditions, or, rather, those which are associated with the earlier development of the uterus. Anteflexion may be ascribed, first, to the long cervix of the puerile organ, the situation of which, in the vagina, necessitates the fundus bending forward over it. Second, inflammation in the uterosacral ligament or in the cellular tissue posterior to the uterus, which draws the cervix upward (Fig. 369), promotes, in a flexible body, its falling forward, and the angle between the body and the cervix is increased. Third, the displacement arises from localized inflammation

at the site of the placenta, when situated upon the posterior uterine wall. Involution is more rapid in the anterior, and the shorter wall becomes the string of the bow which bends the uterus forward. Fourth, anteflexion is produced by growths in the fundus of the uterus.

435. Symptoms.—The symptoms most frequently attributed to anteflexion are sterilty and dysmenorrhea; but when uncomplicated by inflammation, neither of these symptoms is necessarily present. The patient with marked anteflexion generally suffers from chronic vesical distress. Pain occurs when the bladder is moderately distended, micturition is frequent, and generally there is a sensation of distress and annoyance, which follows the evacuation. These symptoms, however, are not infrequently produced by inflammation in the bladder, so that, as a rule, the urine should always be carefully examined. Dysmenorrhea has been attributed to an obstruction of the canal from which there is an accumulation of material within the uterine cavity, and the organ has to go into labor to expel it. As flexion does not cause dysmenorrhea when the lesion is uncomplicated by inflammation, it is evident that the latter is the cause of the symptom, and that the hyperemia prior to and coincident with menstruation produces pain during the distention of the inflamed surfaces rather than an obstruction of the canal. Even in the congenital conditions the dysmenorrhea does not occur with the first menstruation, but later, when there is distinct evidence of the development of inflammatory trouble.

436. Diagnosis.—Anteflexion is recognized by digital and bimanual palpation. The cervix is situated in the axis of the vagina, and, by carrying the finger in front of it, a body is felt in the anterior fornix of the vagina, between which and the cervix a distinct angle is recognized. During bimanual palpation this angle can to some degree be straightened, and the relation of the flexion to the cervix and body is more distinctly recognized. The flexion is particularly determined by passing the index-finger into the lateral fornix, first upon one side and then upon the other; by pressing from above we are able to recognize the lateral borders of the uterus and the absence of any growth. We can be in doubt as to whether the mass found in front is the fundus uteri or a fibroid growth attached to the anterior wall. Each condition may afford an equal sized angle. The method we have already described, of passing the finger along the lateral aspect of the uterus, will enable us to differentiate them. By changing the position of the organ, and pressing it well forward with the hand over the abdomen, we can outline the posterior surface of the fundus,

and determine that its size and relations correspond to those of the cervix to the fundus, rather than to a growth. When the uterus is fixed, bimanual palpation is difficult. The position of the organ can be determined by the introduction of a uterine sound into the canal. The use of the sound, however, under these or any other circumstances, is fraught with so much danger that it is preferable to administer, if necessary, an anesthetic for the further practice of the bimanual, rather than to make an intra-uterine exploration.

Rectal palpation with the digital finger, while the thumb of the same hand is placed in the vagina against the cervix, and the other hand over the abdomen, enables us to bring the uterus definitely under observation.

437. Treatment.—Anteflexion requires treatment only when it is associated with symptoms, and these are usually the result of complications. The symptoms may be caused by complications incident to changes in the structure of the uterus itself, as inflammation either in the wall of the organ or in the surrounding structures. It may be incident to the various constitutional conditions, as a rheumatic or gouty diathesis, the effect of neurasthenia, but in such cases the treatment may be constitutional or a combination both of constitutional and local measures. The most frequent symptoms associated with this displacement are those of dysmenorrhea or painful menstruation, and sterility. That these symptoms, however, are not necessarily the result of anteflexion alone is evident, from the many cases in which the patients with marked anteflexion have both menstruated painlessly and given birth to children. Patients suffering from dysmenorrhea, associated with anteflexion, should be encouraged to live an outdoor life. Hygienic measures are particularly important. The clothing should be suitable, and the extremities be warmly clad. Very frequently women who suffer from dysmenorrhea while in our northern climates, will be absolutely free from this symptom when residing in the South, or in the Bermuda Islands. Measures should be instituted to improve the general nutrition, to obviate the sluggish circulation, to regulate the bowels. Such patients are often improved by bicycle-riding, playing golf, and anything which leads to an outdoor life. Pelvic or uterine congestion should be decreased by the administration of iodids and bromids, the employment, particularly, a few days to a week before the menstrual period, of gelsemium or pulsatilla, taking five drops of the fluid extract of gelsemium or ten drops tincture of pulsatillæ, three or four times in the twenty-four hours, until the patient exhibits signs of its physiologic action. Thyroid extract has proved of value in these

cases, when the drug is given in doses of three to five grains two or three times in the twenty-four hours. Douches, tampons, painting the vault of the vagina with tincture of iodin, gauze packing, and pelvic massage are all of service. The pessary, particularly the Graily-Hewitt (Fig. 353) or the Thomas anteflexion pessary (Fig. 366), which tilts up the fundus of the

Fig. 366.—Thomas Anteflexion Pessary.

Fig. 367.—Stem-pessary.

uterus, have had their advocates. Their efficacy, however, is somewhat doubtful. Pelvic massage is of special value in these cases, as the manipulation of the uterus serves to straighten the organ and promote a healthy condition of its circulation. When the patient is not improved by douches, tampons, or constitutional measures, the uterus may be dilated by the introduction of a laminaria tent. This procedure should be done under most thorough aseptic precautions, with the vagina thoroughly cleansed, the cervical canal rendered as aseptic as possible, and the tent itself sterilized, preferably by dry heat. However, the tent may be placed for several minutes in a solution of iodoform and ether, or in equal parts of alcohol and carbolic acid, prior to its introduction. The cervix should be seized with a double tenaculum, sponged with a solution of formalin, and by traction straightened so that the tent can be the more readily introduced. As large a tent as the caliber of the cervical canal will allow should be employed. The tent is removed in from twelve to fourteen hours, after which the uterine cavity is irrigated, if necessary cureted, swabbed with a saturated solution of iodin in carbolic acid or of iodoform in ether. The canal may or may not be packed

Fig. 368.—Section Showing Thinning of Cervical Walls at the Angle of Flexion.

with iodoform gauze. The dilatation with tents may be repeated at intervals until the tendency to displacement appears to be overcome and the complicating involvement of the uterus has subsided. Inflammation in the cellular tissue about the uterus, or in the tubes and ovaries, as evidenced by their being enlarged and fixed in the pelvis, should be considered a contraindication to the employment of tents. The dilatation can be accomplished by graduated bougies and their employment followed by curetment and the use of the glass drain. Twenty-

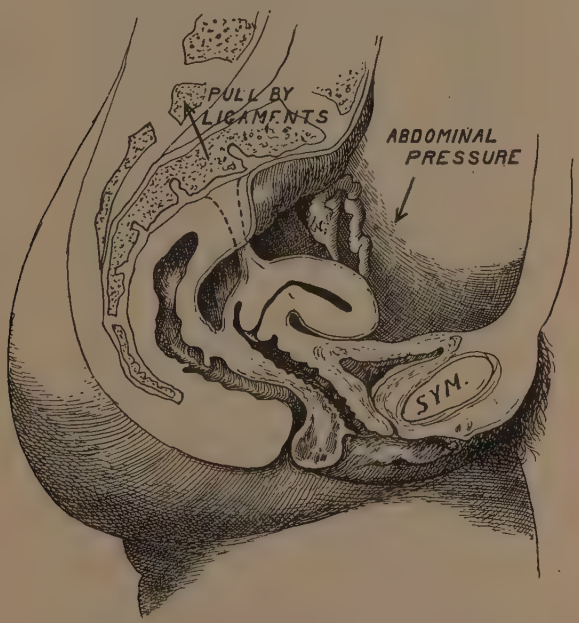


Fig. 369.—Anteflexion Associated with Contraction of Uterosacral Ligaments.

five years ago the employment of the stem-pessary was a favorite method of overcoming an anteflexion. The stem was one-eighth of an inch shorter than the uterine cavity; the patient was required to wear it for a considerable length of time (Fig. 366). The objection to the stem-pessary is that it is a source of irritation, affords constant danger of infection to the uterine mucosa, and may lead to the development of more serious trouble. The favorite treatment of Sims was a bilateral incision; occasionally one through the posterior lip. Unless precautions are taken to prevent union, the parts are reunited. Even when precautions are employed, cicatricial tissue forms, which subsequently causes distress, sometimes greater even

than the pre-existing condition. The posterior lip can be split up to the angle of flexion and its cervical and vaginal lining membranes united by sutures, to prevent reunion. Occasionally, after such an operation, the cervix spreads out owing to the intra-abdominal pressure, and the more delicate cervical mucous membrane is thus exposed to pressure and irritation, resulting in endometritis and formation of cysts of Naboth, which will require continuous treatment. Splitting

Fig. 370.—Dudley's Operation for Anteflexion, by Incising and Suturing the Posterior Lip.

the anterior lip has been advocated. This is performed by dissecting the bladder from the anterior wall of the cervix to the level of or above the point of flexion. A grooved director is then introduced into the uterus and the cervix is incised. As the incision approaches the os, it is carried around to the side of the cervix. The cervical mucous membrane is united to that of the vaginal wall. This enlarges the opening from

the front and prevents obstruction, but is subject to the same objection made to the posterior operation, in that it exposes delicate surfaces to irritation and subsequent inflammation. E. C. Dudley has devised an ingenious operation, in which he splits the posterior lip beyond the vaginal attachment; the surfaces are held apart by tenacula and the incision is deepened upon the cervical side with a knife. A wedge-shaped piece is

Fig. 371.—Completion of Dudley's Operation, by Transverse Denudation and Suturing of the Anterior Lip.

removed from each side, and the sutures are so introduced as to unite the edge or apex of the incision on each side with the base. By this method, eversion of the cervical mucous membrane is prevented. (See Fig. 370.) The anterior lip of the cervix is then amputated, and the wound closed with transverse sutures, which push back the cervical orifice and straighten the canal. (See Fig. 371.) Nourse, recognizing that the flexion corresponded to the shorter wall, made a bi-

lateral incision to the level of or a little above the angle of flexion. Traction is then made upon the posterior lip, which results in straightening the canal. The new surfaces are apposed

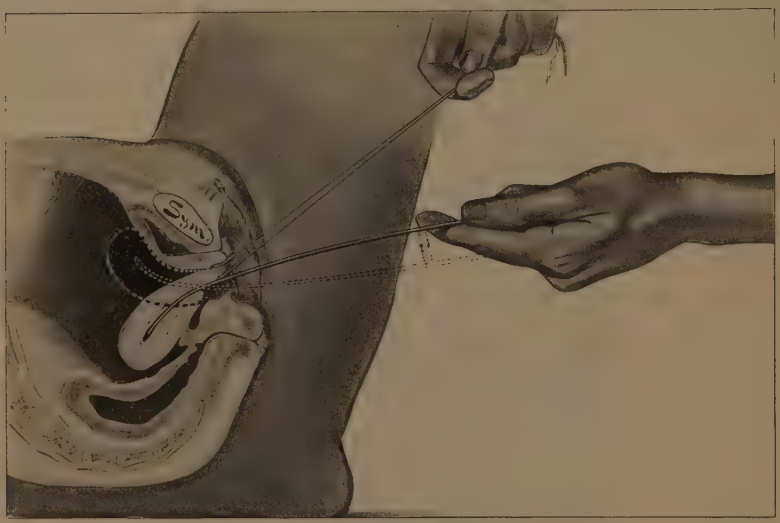


Fig. 372.—Nourse's Operation by Splitting the Cervix and Resuturing the Incisions.

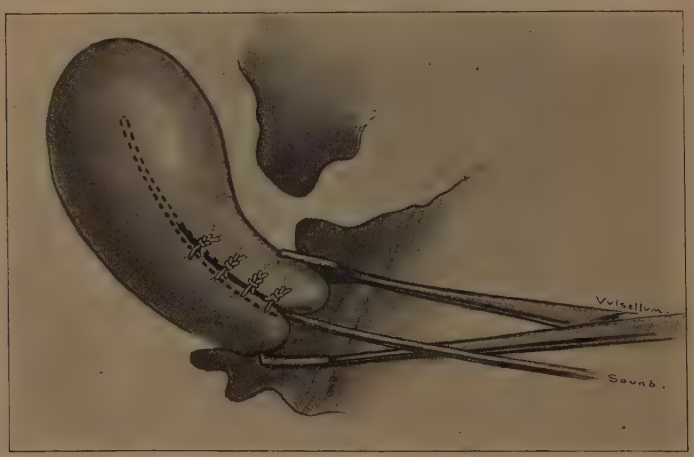


Fig. 373.—Operation Completed.

and secured with sutures, leaving the posterior lip longer. When the latter is half an inch or over in length, it is amputated by the flap method, thus making it the same length as the anterior

lip. The raw surfaces are united by suture (Figs. 372 and 373). When the elongation is short, it is left to contract. C. A. L. Reed advocated opening the abdomen and removing a wedge-shaped piece from the posterior wall of the uterus opposite the angle of flexion. This surface is closed by vertical sutures and restores the organ to normal position. Burrage advises, in proper cases, incision of the uterosacral ligaments and the performance of a ventrosuspension, thus raising the fundus of the organ upward.

438. Retroflexion.—In retroflexion the fundus is bent back-

Fig. 374.—Retroflexion of Slight Degree.

ward upon the uterine axis, and, according to its degree, lies toward the rectum (Fig. 374) or is forced well down into Douglas' pouch (Fig. 375). The cervix is in the axis of the vagina. The retroflexion may be mobile or immobile, may be pathologic or indifferent, but can never be said to be physiologic. This form of displacement is very frequently a sequel of version. The uterus becomes retroverted and the abdominal pressure then drives the fundus downward, bending it upon its axis, forcing it into Douglas' pouch (Fig. 376).

439. Etiology.—Retroflexion is produced by metritis; subinvolution; inflammation of the placental site, in the anterior wall of the organ; fibroid growths in the fundus or anterior uterine wall (Fig. 377), parametric inflammation, or cellulitis of the anterior segment of the pelvic floor, which draws the cervix forward; localized peritonitis; or contraction following hematocele (Fig. 378), by which the fundus of the organ is drawn backward.

440. Symptoms.—Retroflexion, like the other forms of displacement, when uncomplicated presents no special symptoms.

Fig. 375.—Retroflexion of Extreme Degree.

It produces a sensation of weight and pressure, not infrequently pain in the region of the anus, an uncomfortable sensation down the posterior surface of the lower extremities, points of anesthesia over the thighs, congestion, partial obstruction of the rectum, obstinate constipation, and not infrequently a sensation that the intestine is so obstructed that the bowel can not be evacuated. Development of hemorrhoids, anal fissures, and more or less prolapse of the rectal mucous membrane not unusually follow. Menstruation is irregular and profuse, or the menstrual intervals are shortened, and leukorrhea is quite profuse.

441. Diagnosis.—Digital examination discloses the cervix situated at a lower level in the pelvis, occupying the axis of the vagina or directed a little anteriorly; the finger in the posterior fornix recognizes a body slightly above, or even below, the cervix, which is rounded, may be movable or fixed and somewhat larger than the normal fundus. Between it and the cervix is a distinct angle, though the structures can be traced from one to the other. The finger in the anterior vaginal fornix and the other hand over the abdomen, discloses the absence of the fundus uteri from its normal position. The flexion is

Fig. 376.—Retroflexion Following Version

apparently increased by pressure upon the cervix, and the fundus is driven more deeply into the culdesac. By pressing the finger upward on either side of the uterus and cervix the lateral margins can be determined. Digital examination through the rectum enables us to pass directly over the fundus and to feel to some degree its anterior surface, which now becomes posterior. Retroflexion of the uterus can be confounded with fibroid growths (Fig. 379) situated in the posterior uterine wall, adherent ovarian growths (Fig. 380), and pelvic inflammatory exudation. (Fig. 381.) The introduction of the sound into

the uterine canal, and its passage backward into the mass, would be definite evidence that a retroflexion exists; but, as in other uterine conditions, this procedure is fraught with so much danger that it is preferable to make the diagnosis without it, and, if necessary, even to leave it uncertain. With

Fig 377.—Retroflexion Produced by Fibroma of Anterior Uterine Wall.

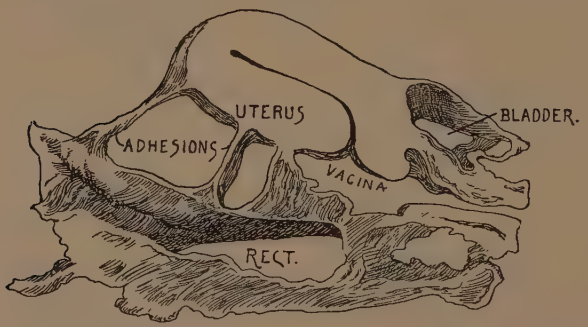


Fig. 378.—Retroflexion the Sequel of Inflammatory Adhesions.

a careful bimanual examination, as has been advised, by the rectum, the vagina, or both, we are generally able to determine the relations of the uterus to the surrounding parts, and absolutely to fix the diagnosis. When the existence of pelvic exudate or immobility of the uterus and a resistant or thick

abdomen prevent its accomplishment, the patient should be given an anesthetic.

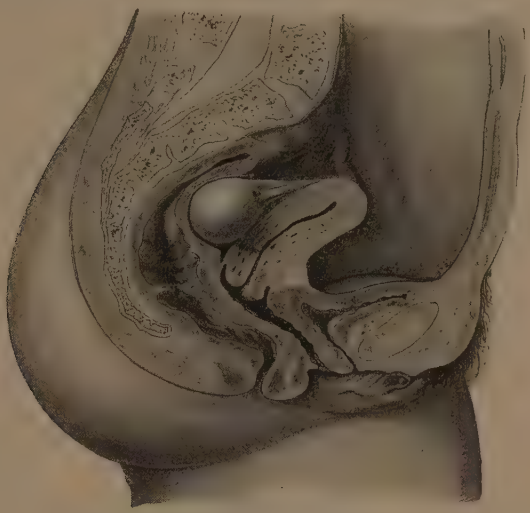


Fig. 379.—Retroflexion Simulated by Posterior Uterine Myoma.

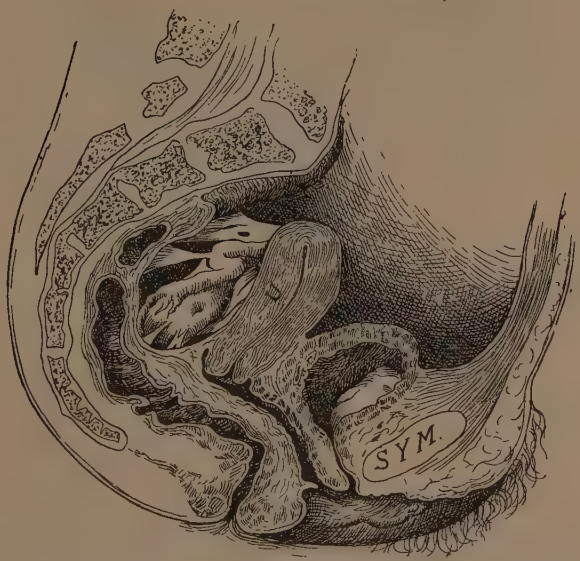


Fig. 380.—Retroflexion Simulated by Small Ovarian Cyst in Posterior Culdesac.

442. Treatment of Retroversion and Retroflexion.—As retroflexion is simply a bending of a version, we will, therefore, con-

sider the treatment of these two conditions together. As the majority of the other displacements are not characterized by symptoms, unless complications are present, so, in these conditions, symptoms are not manifest without the existence of complications. The organ, however, in maintaining a retroposition, interferes with its circulation, which results in congestion and subsequently in more or less inflammation. Therefore the treatment of the complications is ineffective so long as the displacement remains. The relief of the inflammatory condition is expedited by maintaining the uterus in a correct position. Treatment largely depends upon the duration of the displacement, the changes which the structures have under-

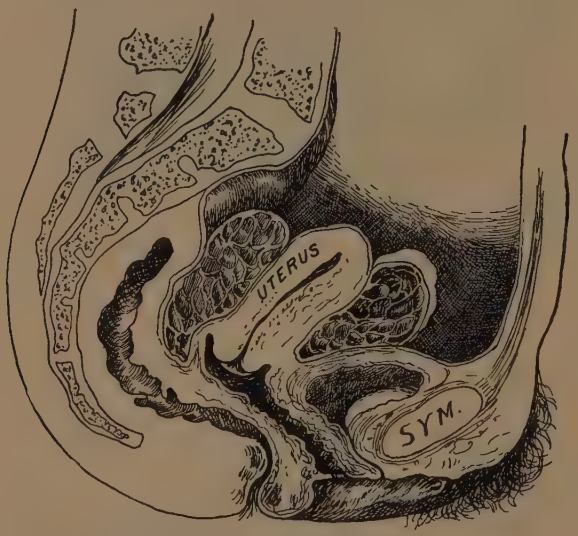


Fig. 381.—Anteflexion and Retroflexion Simulated by Pelvic Exudation.

gone, and the ability of one to replace and maintain the organ in proper position. No means for maintaining the uterus in position are effective until it has first been accurately replaced, after which it can be supported with relief of many of the distressing symptoms. Three methods are generally recognized as proper for replacing the organ. These are: (1) The bimanual. The patient is placed in the dorsal position with her limbs flexed. Two fingers are introduced into the vagina, while the fingers of the other hand are placed over the abdomen (Fig. 382). The middle or long finger is passed into the posterior fornix of the vagina to press up the fundus, while the index-finger is carried in front of the cervix to push it backward.

The pressure against the lower end of the lever carries the opposite end, the fundus, forward, until it can be grasped by the external hand and brought into a position of anteversion. In some cases the fundus of the uterus is caught beneath the promontory of the sacrum and cannot readily be dislodged. If the cervix, however, is grasped with a double tenaculum or vulsellum, and drawn down, while the fundus is pushed up with the finger in the vagina or rectum, the fundus uteri is readily displaced from beneath the promontory and the cervix can then be carried backward. The second procedure consists in placing the patient in the genupectoral position and the employment of the Sims speculum to open the vagina.

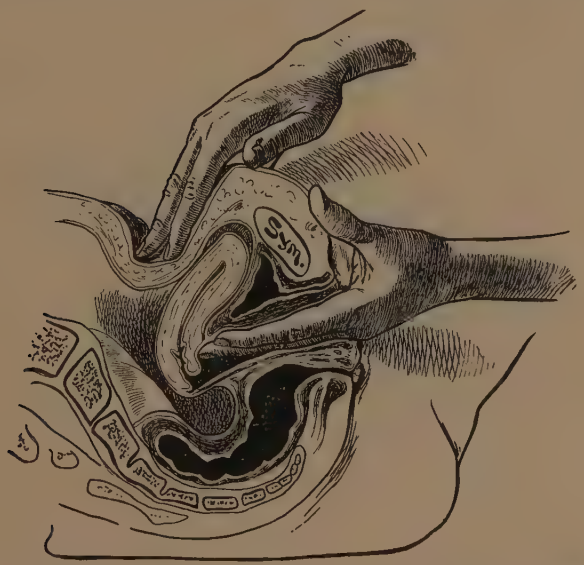


Fig. 382.—The Retroverted Uterus Replaced; Patient in Dorsal Position.

The atmospheric pressure balloons the vagina and the uterus is carried to the upper part of the canal. This procedure, however, does not of itself correct the position, as the uterus, though elevated, may still be retroflexed or retroverted. The position, when uncomplicated, may be readily corrected by seizing the cervix with a tenaculum or vulsellum, and drawing it toward the vaginal orifice, and then carrying it backward and upward. The fundus is thus dislodged and the position corrected. A third procedure consists in the employment of the uterine sound. With the patient in the dorsal position, two fingers are introduced into the vagina and the sound, carried between

them, enters the os and is introduced to the fundus and then rotated. The external end of the sound is carried through a wide arc so as to do as little injury to the internal mucous membrane as possible, while the handle of the sound is depressed and the finger in the posterior fornix pushes the fundus upward. This combined movement carries the fundus forward until it can be controlled with the external hand. In spite of the most careful precautions, the uterine mucous membrane will be injured by this method of procedure. It is exceedingly difficult to avoid the danger of the introduction of infectious material into the uterus, which necessarily favors the development of further complications. For such reasons, the sound should not be employed, especially as every purpose attained by its use can be readily accomplished by the employ-

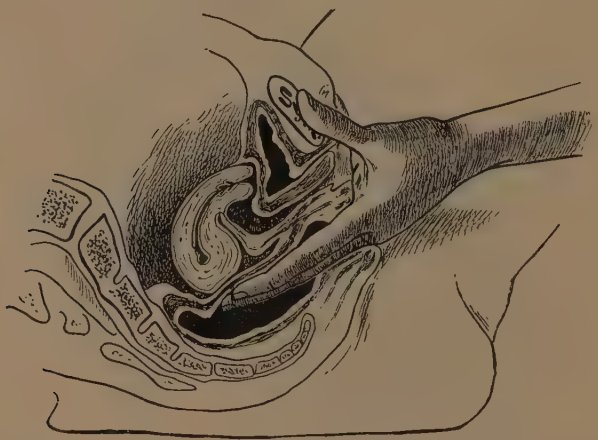


Fig. 383.—Schultze's Method of Replacing an Adherent Retroverted Uterus.

ment of the dorsal manipulation or with the patient in the genupectoral position. Various jointed sounds have been devised for the purpose of replacement of retrodisplaced uteri, but these instruments are open to the same objections offered to the use of the ordinary sound.

In adherent uteri none of these methods of procedure will accomplish the restoration of the displaced organ. When the adhesions exist between the posterior uterine surface and the anterior rectal wall, the intestine may be dragged up with the uterus and apparently permit it to assume its normal position; but as soon as the supporting force is removed, the uterus is drawn back and, if mechanical efforts are employed to maintain it in position, the fundus is bent backward and the retro-

flexion is greatly increased. If adhesions are present and they are not too firm and of too long duration, pelvic massage affords a valuable method for overcoming their baneful influence and promoting their absorption. The massage should be supplemented by the use of tampons. In some cases the pressure of an air pessary within the vagina stretches the bands of adhesions, promotes their absorption, and supports the uterus. Schultze advocated a procedure which is very effective in overcoming recent adhesions. The patient is placed in the dorsal position, with the muscles well relaxed by an anesthetic. Two fingers are introduced into the rectum, while the thumb in the vagina against the cervix steadies the uterus until the rectal

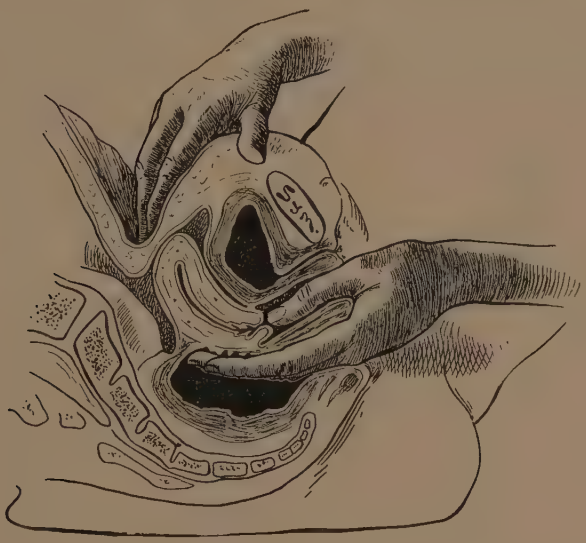


Fig. 384.—Second Step in Replacing Uterus by Schultze's Operation.

fingers, one on either side of the fundus, can invert and draw down the bowel and separate it from the uterine surface (Figs. 383 and 384). As the adhesions are separated and the uterus is set free, the external hand grasps the fundus and draws it forward, after which the remaining bands of adhesion are broken up. Care must be exercised in carrying out this procedure not to employ too much force, otherwise the intestine may very readily be injured. There is more danger, however, of injuring the tubes or ovaries, when these organs are adherent. An adherent tube may be torn and liberate poison at the seat of inflammatory trouble, which, particularly if of a purulent character, would be followed by a violent attack of pelvic or

possibly general peritonitis. With purulent inflammation or pus collections in the tube excluded, the absorption and loosening of the adhesions of the ovary, tube, and uterus can be effected by pelvic massage. If the adhesions are extensive and the vagina tender, especially when its posterior fornix is more or less obliterated by the long duration of the displacement, the uterus can be temporarily supported by the employment of vaginal tampons, medicated or not, as the conditions require. The employment of continual pressure over the abdomen or within the vagina may be effected by shot-bags or the employment of rubber bags containing mercury. Three to five pounds or more of shot may be applied over the abdomen to make pressure over a mass of exudate and thus promote its absorption and the setting free of an adherent uterus. The absorption of the vaginal exudate may be expedited by the use of mercury, applied in a rubber bag. Such a weight introduced into the vagina, with the position of the patient changed from time to time in order to subject different portions of the exudate to the weight, promotes its absorption and the consequent loosening of the uterus and pelvic structures.

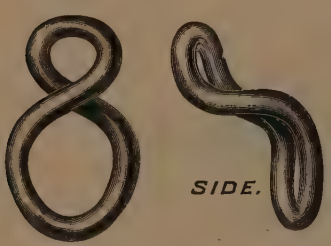


Fig. 385.—Schultze Pessary.

When the uterus is free from adhesions and, consequently, can be readily replaced, we can at once resort to the use of a pessary. Some of the more prominent retrodisplacement pessaries are the Hodge (Fig. 348), Thomas, Munde (Fig. 349), and the Schultze (Fig. 385) instruments. The various modifications of the Hodge pessary consist of a posterior bar with converging side bars which are united by a shorter bar anteriorly. Laterally, the pessary has the shape of a letter S. The posterior bar is carried behind the cervix into the posterior fornix. In its modification by Thomas and Munde, the posterior bar is thickened, which makes a larger mass in the fornix. The pessary does not support the body of the uterus on its posterior bar, but it so drags upon the posterior vaginal fornix as to pull against the cervix and lift it up, until the other end of the lever—the fundus—is held so far forward that the intra-abdominal pressure is directed upon the posterior uterine surface. This pulley-like action of the pessary is readily seen in Fig. 386, which shows the proper position of the pessary in relation to the uterus and vagina. It has already been emphasized that the pessary does not support the body of the uterus, and that the position of the organ must be corrected

before the introduction of the instrument. The result of an attempt to employ the pessary to correct the position of the uterus can be seen in Fig. 387. It is very important that the pessary should not be unduly long. When too much pressure is produced, laceration of the vagina occurs, rendering the patient unable to retain it, or, if the instrument is too long, it may project from the vulva and cause irritation about the urethra or neck of the bladder, and much discomfort in sitting. The proper length of the pessary is readily determined by the introduction of two fingers into the vagina to measure the distance between the distended posterior vaginal fornix and the internal margin of the symphysis. The proper width of the pessary

Fig. 386.—Proper Position of the Pessary.

is appreciated by determining the extent to which the fingers can be separated without undue lateral pressure in the vagina. The proper size of the instrument to be employed is thus ascertained. While a pessary too long produces the conditions we have already mentioned, one too short allows the fundus of the uterus to fall backward over its posterior bar and increases the retroflexion and adds to the distress of the patient. It is difficult to maintain the pessary in place where the vagina is much relaxed. If the uterosacral ligaments are much elongated, and the posterior fornix distensible, the pessary will

fail to maintain the uterus in its normal position, and, moreover, it will permit the organ to drop back and rest upon the instrument (Fig. 387). Schultze designed the pessary known as the figure-of-8, which is very effective for such cases. This pessary laterally is similar in shape to the Hodge instrument, forming a letter S. The lateral bars of this pessary are twisted to form a figure-of-8, the upper loop of which surrounds the neck of the cervix and carries it upward, while the inferior loop is so broad that it receives support from the vagina and does not incline to prolapse. Should the figure-of-8 prove unsatisfactory, the sledge pessary of Schultze may be efficient

Fig. 387.—Faulty Position of the Pessary.

(Fig. 388). Its posterior end has a bar curved forward, which rests in front against the cervix, and holds it back, while at the same time traction is made upon the cervix through the distention of the posterior fornix by the upper part of the instrument. The pessary should be sufficiently broad to impinge against the side walls of the vagina to prevent it being displaced downward. It distends the vagina in three directions—in length, laterally, and in the antero-posterior direction. When adhesions are present, the pessary is badly borne and is harmful. It is at all times a foreign body and produces a certain amount of irritation in the vagina, which, to many patients,

is a source of much discomfort; besides, it is not always efficient in maintaining the uterus. It must be worn for months or even years to secure sufficient contraction to maintain the organ, consequently many patients prefer to submit to operative interference.

The pessary may be employed in retroversions due to subinvolution of the uterus subsequent to a recent delivery. In such cases the pessary will maintain the uterus at a higher level, promote the process of involution, and thus favor the maintenance of the organ in a replaced position, after it has reached its normal size. It may be employed after adhesions have been broken up, by the Schultze method, or when we have been able to accomplish the loosening of the uterus by pelvic massage. Where retrodisplacement has existed for some time, the posterior fornix of the vagina may be so shortened that the pessary can not be worn. Such a condition will require treatment by douches and tampons until the posterior vaginal fornix is stretched. They are also of little value in those cases in which the vaginal portion of the cervix has been destroyed by amputation or as a result of repeated labors. As the pessary is a foreign body, it is therefore, important that explicit directions should be given regarding its management before this subject is dismissed. Directions have been given for the determination of a suitably sized instrument, and I would again emphasize the fact that the instrument should be neither too large nor too small. The former will cause pressure upon the surrounding parts, producing irritation, ulceration, loss of structure, and open avenues for the entrance of infection. A smaller instrument is easily dislodged from its position, does not serve any useful purpose, and may only serve to aggravate the condition. The patient should be directed to remove or have the instrument removed, if it gives rise to increased discomfort, and return to the physician within a week at least after its introduction. He can then determine definitely whether the instrument is serving its proper purpose or causing any irritation. In neurotic patients too much attention must not be given to the instrument, otherwise the patient will manufacture a long train of distressing symptoms and attribute them to its presence. The instrument is likely to increase the vaginal discharge, and for this reason it is important that it should be kept clean. It is undesirable, how-

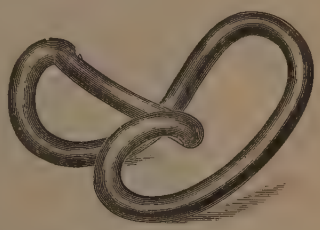


Fig. 388.—Schultze's Sledge Pessary.

ever, to employ mineral astringents in the douche for this purpose, as they are likely to become deposited upon the surface of the pessary, thus rendering it rough and, therefore, more likely to serve as an irritant. A properly fitting instrument can be worn by the patient without her being aware of its presence, but even though it causes no annoyance, the patient should be advised of the importance of having it removed at stated intervals, not exceeding three months, for cleanliness, and to make sure that it is producing no irritation. These rules apply to the hard-rubber instrument. Where the in-

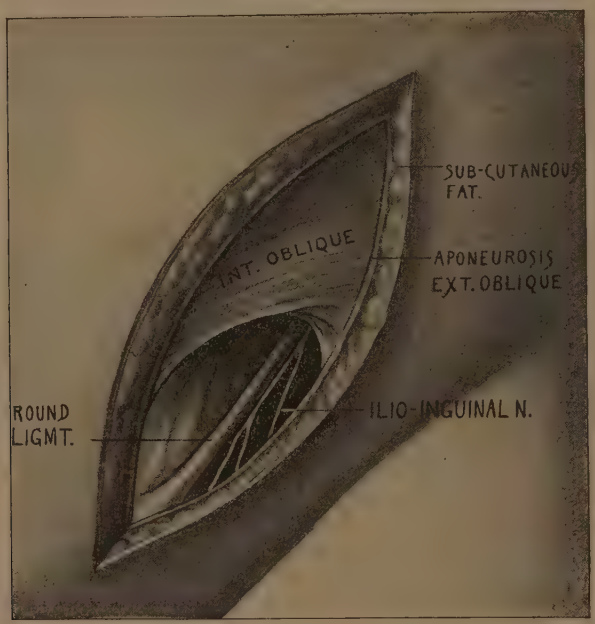


Fig. 389.—Alexander Operation; Round Ligament Exposed.

strument is of the soft-rubber variety, it should be removed much more frequently, as the discharges to some degree enter into the rubber, decomposition takes place, and a foul odor arises which is very annoying to the patient and to those with whom she is associated; moreover, it may give rise to systemic infection.

The *operative procedures* for the correction of retrodisplacements of the uterus consist of the extraperitoneal and intraperitoneal shortening of the round ligaments, by abdominal or vaginal incision, and the construction of artificial ligaments, as in such operations as ventrofixation or ventrosuspension.

Besides these, there are also numerous vaginal operative methods for connecting retroplaced uteri.

Extraperitoneal Shortening of the Round Ligaments.—Shortening of the round ligaments is an operation which was performed by Alexander in December, 1881, and two months later by Adams, although the latter contributed the first publication. The operation had, however, been advocated by a Frenchman

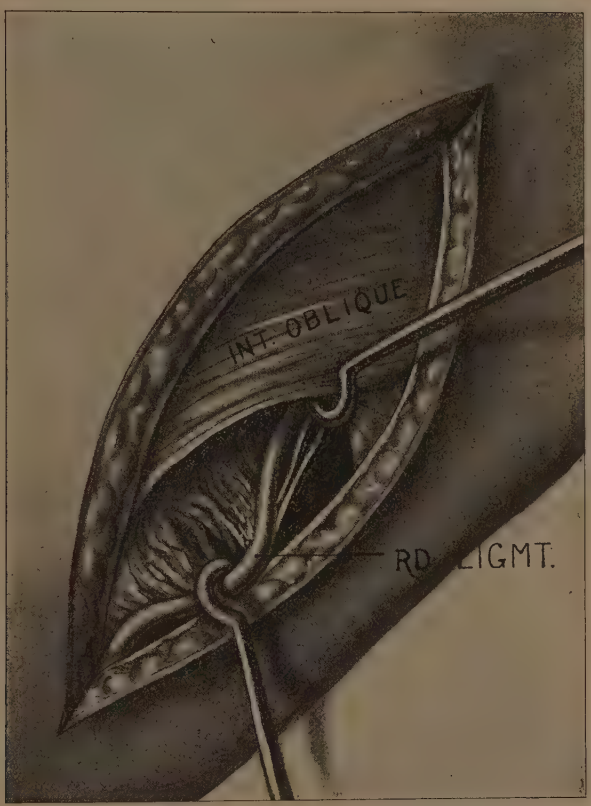


Fig. 390.—Round Ligament Being Drawn Out.

named Alquie, as early as 1840. The operation requires two incisions, and each consists of four stages: (1) An incision six centimeters long, a little inside the pubic spine and above and parallel to Poupart's ligament, is made through all the tissue to the aponeurosis of the external oblique (Fig. 389). (2) Exploration for the round ligament. This is disclosed by a small ball of fatty tissue which covers its end between the

pillars of the external inguinal ring. Pressure upon the side causes the mass to protrude. A hook passed beneath this mass enables the operator to raise up the ligament (Fig. 390). It is then detached by a director, from the posterior adherent fibers which maintain its relation to the inferior part of the canal, after which it is seized with a pair of forceps and drawn

Fig. 391.—Round Ligament Sutured.

out. Upon the completion of the first and second stages, on both sides, we proceed to the third, which consists in shortening and fixation of the ligaments. The ligaments are drawn upon until the fundus is brought under the pubes. This movement can be facilitated and rupture of the fibrous filaments avoided by previously placing the uterus in anteflexion, either by the

sound or preferably by the aid of the fingers of an assistant. The ligaments are drawn out from four to ten centimeters, according to the resistance. When they become tense, they are maintained by an assistant, while a needle charged with silk, silkworm-gut, or catgut is made to traverse the external pillar, the ligament, and next the internal pillar (Fig. 391). Three sutures are thus introduced, one centimeter apart (Figs. 392 and 393). (4) The wound is closed with silk or silkworm-gut sutures, dressed with gauze, and the parts are so secured by bandaging as to prevent the wound from becoming exposed by the movements of the patient. The employment of a Hodge pessary for two months following the operation is advisable, though some prefer the tampon. Various modifications of this operation have been devised. Edebohls splits the entire length of the inguinal canal, draws the ligaments out at the internal ring, and closes the wound as in the Bassini operation. Newman makes an incision directly over the internal ring, draws the ligament straight out, and secures it in the wound. Franklin Martin and Duret, of Lille, do not use sutures, but pass a pair of dressing forceps beneath the skin and subcutaneous tissue from one wound to the other, draw the ligament through, tie the two ligaments together in a knot, and close the tissues over the union. Cassati joins the lower ends of the lateral wounds with a curved incision, in which the crossed ends of the ligaments are united by continuous suture. Doleris employs the same method, uniting the two ligatures with catgut sutures,

Fig. 392.—Continuous Catgut Suture Uniting Internal Oblique Muscle to Poupart's Ligament.

after pulling them through, as in the method suggested by Martin. Goldspohn attempts to extend the usefulness of the Alexander operation by stretching the internal ring and opening through the peritoneum, so that the finger can be passed into the pelvis and break up adhesions about the uterus, ovaries, and tubes. By this method a tube or ovary can be withdrawn and subjected to necessary treatment. The advantages claimed

Fig. 393.—Return Layer of Suture Bringing External Oblique Muscle in Apposition.

for the Alexander operation are: (1) The incisions being superficial or extraperitoneal, the risk of infection is less; as it is local, the danger of peritonitis is decreased; (2) the method of maintaining the uterus forward has less injurious influence upon a future pregnancy; (3) it imitates the natural support, in that the natural ligaments are employed; and (4) no intraperitoneal adhesions can form. The disadvantages are: (1) That two

incisions are required. (2) The operation is limited in its application. It is only in those cases in which the uterus is mobile that we can practise this procedure. Consequently it has the further disadvantage in that we are not always able to determine definitely the existence of adhesions between the uterus and the anterior wall of the rectum. Should such adhesions exist, the uterus drawn forward by the round ligaments is subject to forces which tend to render the operation nugatory. The procedure of Goldspohn seeks to overcome this objection; nevertheless, the objection still remains, for the operation to break up adhesions and treat the pelvic organs is done through so small an opening as to render it more or less a blind procedure. Besides, severe injuries may occur and be readily over-

Fig. 394.—Wylie's Operation for Shortening the Round Ligaments within the Abdomen.

looked. (3) The round ligaments are sometimes so attenuated as to be of little use in maintaining the organ. In an operation of mine, the ligament on one side was apparently entirely absent. I found no vestige of it in the canal. I therefore opened into the peritoneal cavity and found that the round ligament had disappeared. (4) In cases of infection the infected ligament may slip back and carry infection beneath the peritoneum, where it will be difficult to reach, and, consequently, render the operation, as has been proved, not altogether free from danger.

Intraperitoneal Shortening of Round Ligaments.—The round ligaments are shortened within the peritoneal cavity by making an incision through the abdomen in the median line. This procedure permits the uterus to be drawn up, the condition of

the appendages examined and treated, if necessary. Existing adhesions can be broken up and the round ligaments shortened by folding them (Fig. 394). Wylie suggests that from two to four inches of the ligament be doubled up on each side and united

Fig. 395.—Mann's Operation for Intra-abdominal Shortening of Round Ligaments.

Fig. 396.—Dudley's Operation of Desmopycnosis.

by sutures, so that the shortened ligament draws and holds forward the fundus. Mann grasps the broad ligament about the junction of its middle and outer third and folds the ligament

in three parts, which are united by sutures (Fig. 395). By this method the ligament is well shortened on each side. A. P. Dudley, of New York, performed an operation which he calls

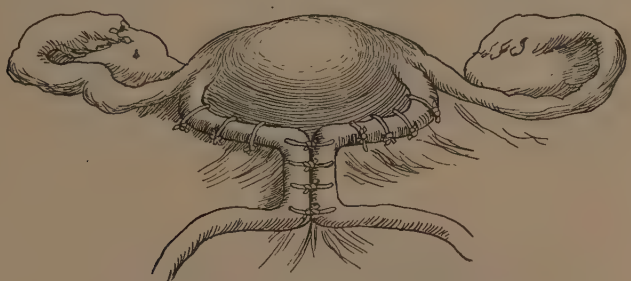


Fig. 397.—Dudley's Operation Completed.

desmopycnosis (Fig. 396). This is accomplished as follows: The abdomen opened, an assistant introduces two fingers into the vagina and pushes the uterus as high as possible in the pelvis, while the operator brings the organ through the ab-

Fig. 398.—Gilliam-Ferguson Operation. Round Ligament Seized through Stab Wound.

dominal incision. An oval denudation is made upon the anterior uterine wall, making sure that the bladder is not injured, then each round ligament is brought up to the portion of the peritoneal covering on the inner side, denuded to correspond

with that on the uterus, and the three denuded surfaces are then united with catgut sutures. The sutures must be so adjusted as to pass sufficiently deep in the uterine tissue to secure against their cutting out before union has occurred (Fig. 397). This procedure holds the uterus forward in a position of anteversion. Ries cuts a slit through the anterior surface of the fundus, through which a loop of the round ligament, drawn out of its sheath, is carried and fastened on either side. Webster picks up a loop of the round ligament, carries it through the broad ligament beneath the Fallopian tube, and secures it to the pos-

Fig. 399.—Round Ligament Drawn through the Abdominal Wall.

terior surface of the uterus. This procedure has been modified by Baldy, who ligates the uterine end of the round ligaments, incises the ligaments external to the ligature and carries the free end, rather than the loop, through the broad ligament and fastens it to the posterior surface of the uterus. All these operative procedures, however, act upon the strongest part of the ligament, leaving the weakest portion to be stretched out. Gilliam and Ferguson have devised a procedure (Fig. 398) which consists in picking up the ligament, three or four centimeters

from its uterine end, and carrying a loop of it through a stab wound in the lower part of the rectus muscle on either side, and there securing it (Fig. 399). The peritoneal surface just within the ligament has been previously quilted together by a ligature, which is brought out near the peritoneal edge of the wound. This, when tied, closes up the gap in the peritoneal cavity external to the point through which the loop of the ligament is brought out. With these parts secured, the uterus is held forward by a loop of the strongest part of the round ligament, and affords what seems to be an ideal method of maintaining the uterus in an anteflexed position (Fig. 400).

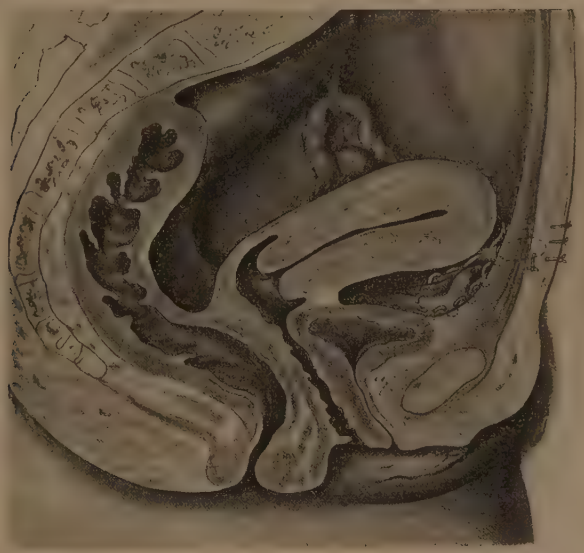


Fig. 400.—Section showing Position of the Uterus with Completion of the Operation.

Ventrofixation and Ventrosuspension.—These terms are applied to the operation devised by Olshausen and modified by Kelly, for establishing an artificial ligament for the purpose of maintaining the uterus forward. The operation consists in an incision in the median line, through which the uterus is exposed and its fundus sutured to the parietal peritoneum at the lower angle of the wound Two or three buried sutures of silk, silkworm-gut, catgut, or silver wire are generally employed (Fig. 401). The first suture is passed through the peritoneum about one centimeter from the wound margin, through the fundus uteri near its center, and brought out through the peritoneum

of the opposite side of the wound. A second suture is similarly placed about eight millimeters behind the first. To prevent the peritoneum from being dragged away from the abdominal wall, it is included in the abdominal suture. Since the first edition of this book, I have modified my method of performing this operation, by introducing a silkworm-gut suture through the fundus of the uterus and the abdominal walls, which is tied externally. Then a needle, carrying a chromic catgut suture, is introduced through the aponeurosis of the lower angle of the right side, through the fundus of the uterus, near the silkworm-gut suture, and brought out through the peritoneum of the opposite side. Two subsequent turns of the suture are passed through

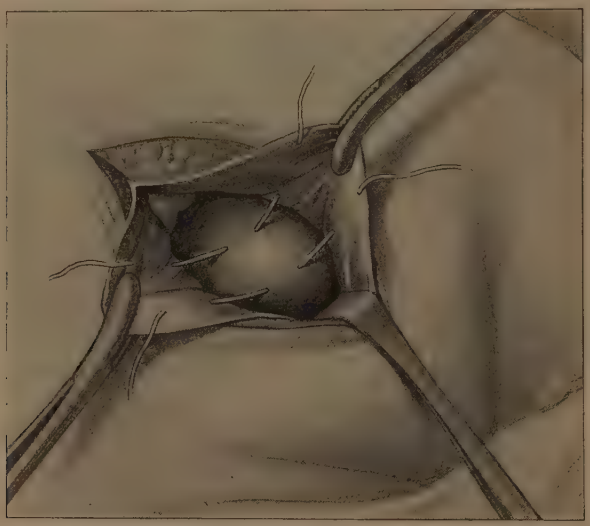


Fig. 401.—Sutures Introduced for Ventrosuspension.

the edges of the peritoneum and the fundus of the uterus, after which the peritoneal wound is closed with the remaining portion of the suture. Following the introduction of silkworm-gut sutures through all the tissues above the peritoneum, this same catgut suture is carried back through the aponeurosis and tied at the lower angle of the wound. Therefore the uterus, peritoneum, and aponeurosis are all held by the one suture, and only a single buried knot remains in the incision. The silkworm-gut sutures are then tied, which bring in apposition and secure the skin-edges. The stay suture, or lower suture of silkworm-gut, is removed about the tenth day. This operation establishes a ligamentous band between the uterus and parietal peritoneum,

which is sufficiently strong to maintain the uterus forward and yet not interfere with its mobility. Where it is preferable—as, for instance, after the climacteric, or in patients from whom both ovaries have been removed—that the uterus should be more firmly fixed to the abdominal wall, it is better that the peritoneum should be pushed back so that the sutures bring the muscle structure directly in contact with the fundus of the uterus. Such a course secures a firmer union and, therefore, the uterus is held more closely to the parietal wall. The procedure we have described permits thorough exploration of the pelvic cavity, the separation of adhesions, and the fixation of the uterus through a single incision. The procedure has been greatly modified. By some, the sutures are placed in the anterior uterine wall. The majority of operators insert them in the fundus, the first suture in the line of the Fallopian tubes, and the second a little behind it, thus throwing the uterus forward in slight anteflexion. The purpose of the operation of ventrosuspension is to establish a ligamentous union, which will permit a certain amount of uterine mobility. Consequently the uterus is attached only to the peritoneum, rather than to the muscle wall. To avoid the buried suture, F. Martin has suggested using the urachus, and when it is not well defined, a loop of peritoneum is carried from below upward through a buttonhole slit in the fundus and included in the sutures closing the wound. Bovée employs a portion of muscle aponeurosis. These modifications, however, have no special advantage. The fixation has been accomplished through a transverse incision above the symphysis. This incision only divides the skin and superficial fascia. A vertical incision is then made through the aponeurosis, muscle wall, and peritoneum. The uterus is brought forward and secured by two silkworm-gut sutures through the fundus. These are brought out through the muscle wall and segment of integument below the transverse incision. The remaining portion of the vertical wound is closed with catgut and the transverse incision in the skin with a continuous intercuticular stitch of silk. The suspensory stitches are tied over a gauze roll and permitted to remain two weeks. Ventrosuspension has the advantages already suggested, that it permits the inspection of the condition of the peritoneal cavity, the treatment of diseased appendages, the separation of adhesions, and the fixation forward of the uterus in a position which is unlikely to give distress. It has the following disadvantages: (1) That it has been found to interfere to some degree with subsequent gestation and labor, the patient complaining of more or less pulling and distress during the progress of gestation, sometimes so marked as to cause abortion or premature labor. When the band of fixation is short, large,

and firm, it may prevent enlargement of the uterus and produce thinning of the posterior wall, which will increase the danger of rupture and afford obstacles to the normal progress of parturition. A firm band of adhesion, during pregnancy, after the performance of ventrofixation, may cause a condition simulating a bifid uterus. I have, in three instances, opened the abdomen during pregnancy and cut the band in order to permit the uterus to properly develop. Furthermore, I have seen several instances in which I felt that such a procedure was advisable. In one instance I was called in consultation to see a woman who had had a ventrosuspension performed and who was in labor at full term. The anterior wall of the uterus and cervix were apparently doubled up, forming a shelf upon which the fetus rested with an arm protruding. The attendants, after vigorous efforts to turn the child, had cut off this arm. The fetus was lying in a transverse position, and a part of the body had engaged. After considerable difficulty I succeeded in passing a cephalotribe upon the body of the child, with which I crushed the spine and delivered first the lower extremities, and then the trunk and head. (2) That the operation is not free from danger. I had the misfortune to have one patient in whom a large portion of intestine slipped below the band of adhesion immediately following the operation. This became strangulated and caused death. Similar cases have been reported by Lindfors, Jacobi, Olshausen, and others. The accident in my case occurred almost immediately after the operation, and, although the patient suffered greatly, it was attributed by her attendants to hysterical excitement following the anesthetic, and, when recognized, the condition of the patient was such as to preclude any hope of recovery. It would not require great stress upon the imagination, when one sees these bands of adhesion, to appreciate the possibility of strangulation occurring at periods more remote from the operation, and numbers of such instances are recorded. (3) The buried sutures of silkworm-gut, silk, or silver wire may become a source of irritation, either from immediate infection or later inflammatory changes, and cause a sinus to extend through the abdominal wall and give rise to an unpleasant discharge. Such a sequence, of course, annoys both patient and surgeon until the offending cause—the buried sutures—have been removed or have become disintegrated. Such a sinus may keep up for months or even years. The sutures can occasionally be fished up and removed. For this purpose I know of no instrument better adapted than the hook of the ear spoon devised by the elder Gross for the removal of hardened wax from the ear. If this instrument is ineffective, the surgeon may find himself obliged to reopen the

wound, and frequently the offending ligature will be found deep in the pelvis, at the end of the band of adhesion. For the purpose of avoiding this difficulty, I have employed the chromic catgut suture with a single knot. Burrage has advised ventrofixation for the treatment of immobile anteflexion. Through an abdominal incision he divides the uterosacral ligaments close to the uterus and secures the fundus to the abdominal wall. Schmidt, of Cologne, frees the anterior uterine wall from the bladder by dissection, excises a wedge-shaped piece with its point directed toward the cervical canal, and unites the surfaces by sutures. This draws the uterus forward in a position of anteflexion.

Vaginal Operations.—The ease with which the pelvis can be entered through the vagina has led to the adoption of various operative procedures through this canal for the purpose of maintaining the uterus in proper position. One of the earliest operations performed through the vagina is that known as the Schücking. This consists in passing an instrument, curved, for an acute anteflexion, to the fundus, from which a concealed needle is driven through the anterior vaginal fornix. This needle carries back the ligature, which, when tied, fixes the uterus in a position of anteflexion. Care must be exercised in its employment to avoid injuring the bladder by pushing this organ to one side. Injury of the intestine has also occurred. The ligature is permitted to remain for two or three weeks, when the resulting inflammatory changes will maintain the uterus in an anteflexed position. The procedure is objectionable, in that it is a blind operation, and injury, therefore, may be unavoidable. Instruments have been devised to push the uterus against the anterior abdominal wall and thrust needles carrying ligatures from its cavity, by which the fundus can be fastened; but these are open to the objection already assigned—that they are blind procedures. Vaginal fixation devised by Duhrssen, subsequently practised and modified by Mackenrodt, consists in making a vertical incision through the anterior vaginal wall to the cervix, when the bladder is pushed off until the peritoneum is reached. Without opening the latter, a suture is introduced, and by it the uterus is pulled forward. A second suture, placed higher, near the fundus, is employed to maintain the uterus forward by bringing its ends through the edges of the vaginal incision. Mackenrodt modified the operation by opening through the peritoneum and introducing the sutures at a higher level, thus securing the fundus or anterior wall to the vaginal incision. The peritoneal and vaginal wounds were then closed. This operation for a time was very largely practised, but it was soon recognized that it was likely to cause much distress and discom-

fort during the progress of gestation. Moreover, it often produced profound dystocia, which imperiled the lives of both mother and child. For these reasons, the operation is now rather infrequently practised. Vineberg and Wertheim, through a similar incision, seize the round ligament some three centimeters from the fundus uteri, pass a ligature beneath it, and bring the ends of this ligature out through the vaginal walls on either side of the vertical incision. The ligature is then tied. This holds the round ligament down against the vagina, and, consequently, fixes the uterus forward. The round ligaments have also been shortened through the vagina by performing the Wylie or Mann operation upon them. I have sutured the round ligaments to the anterior surface of the uterus through the vaginal opening. The operation of Ries consists in pulling a loop of the round ligament through a slit in the anterior wall of the uterus. This method has been described under abdominal procedures, but was devised to be performed through the vaginal incision. Through a posterior colpotomy by a vertical incision, Freund and Gottschalk shortened the uterosacral ligaments. The incision was made from just behind the cervix downward, toward the rectum. The peritoneal cavity was opened and a ligature introduced on each side to separate the surfaces. From this opening, a ligature was carried through the middle of the uterosacral ligament and one end of it through the posterior surface of the cervix. The ligature thus introduced on each side was tied, which drew the cervix upward and backward. Consequently, the other end of the lever, the fundus, was thrown forward. Pryor advocates a transverse incision in the posterior fornix of the vagina, through which he breaks up adhesions, carries the uterus forward, and packs gauze into the posterior culdesac. Then with a tampon he presses the cervix well upward and backward. The subsequent adhesion of the cervix in this position leads to correction of the malposition.

443. Lateral Flexion.—Lateral uterine bending may be dextroflexion or sinistroflexion. The position of the cervix is more or less fixed and the fundus of the uterus is drawn to one side by cicatricial contraction, or is pushed to the opposite by a large exudate, an intraligamentary fibroid growth, or an ovarian cyst. No special symptoms characterize the state; the diagnosis is readily determined by the methods already cited for the determination of other forms of displacement.

444. Complications Associated with Displacements.—It has been noted, in discussing the individual forms of displacement of the uterus, that they rarely produce symptoms themselves, and, when it is considered that the organ involved, in its normal condition, weighs less than an ounce, that its circulation is so

extrinsic that the organ can be bent forward or backward without injury thereto, it is difficult to see why so much stress has been placed upon these deviations.

The development of a complication, however, by which the circulation is obstructed, changes the whole aspect of affairs. The most frequent complications of uterine displacements are:

Endometritis.
Metritis.
Salpingitis.
Oophoritis.
Cellulitis.
Peritonitis.

Other complications are:

Ectopic gestation.
Ovarian or myomatous tumors.
Ptosis of the abdominal viscera.

These complications are most frequently primary as regards the production of symptoms, though, as in prolapsus, they may be secondary in the sense that the displacement lessens the resistance to infection.

445. Prognosis of Displacements.—The prognosis of a displacement will depend upon its degree and the existence of complications. In the earlier stage of the displacement, when the distress arises from increased weight of the organ, the mere correction of the position and the maintenance of the organ corrected will bring about a decrease in its size and afford relief from the displacement. After the displacement has existed for some time, it is complicated by chronic inflammatory changes, which will absolutely prevent any procedure from maintaining the organ in its proper position. The symptomatic phenomena, however, can be relieved and the patient be practically restored to health.

446. General Treatment.—It will be seen, from a discussion of the different forms of displacement, that I am disinclined to believe that uncomplicated displacements are likely to produce symptoms. Of course, I can readily understand that when a patient has prolapsus, with the uterus protruding from the body, it necessarily produces disturbance and is subject to unusual irritation from its abnormal location. The small size of the uterus, when normal, the manner in which it receives and discharges its blood-supply, render it difficult to conceive how the mere displacement of so movable an organ should be provocative of the serious symptoms which have been frequently attributed to it. The most frequent complications of uterine displacement are inflammatory processes and their sequelæ, which cause increase in the size of the organ, its fixation by extensive

adhesions, and interference with the performance of the function of the adjacent viscera. The treatment, then, must largely consist in the correction of the existing complication. Experience has disclosed, however, that when such complications exist, their treatment is most effective when associated with measures directed to maintain the uterus in proper position. The methods of procedure most effective to accomplish this purpose are both local and constitutional, such as massage, electricity, and mechanical procedures. The patient should be suitably clad, and wear clothing free from undue constrictions about the waist. Her skirts should be supported from the shoulders. The bowels should be carefully regulated, and the bladder should not be permitted to become overdistended. The existence of periuterine inflammation and extensive exudates can be ameliorated and absorption expedited by the employment of pelvic massage. This is best performed by a daily séance of five to ten minutes or more, after the more severe distress and pain have been relieved. The vault of the vagina may occasionally be painted with tincture of iodin, and in the intervals between the massage, tampons medicated preferably with an antiseptic solution containing glycerin should be worn. The tampon maintains the uterus at a higher level, promotes the absorption of exudation, facilitates involution, and thus favors its maintenance in a normal position. Vaginal douches, hot rectal enemata, hot sitz-baths, or the application of heat over the abdomen or pelvis in the form of hot sand or a peat bath will be found beneficial. Pressure over the abdomen, particularly where a mass of exudate is recognized, will promote its absorption. This action oftentimes causes such an exudate to entirely melt away. The pressure can be effected by the use of a shot bag, by which three to five pounds or more of shot are retained over the affected surface. When the uterus is freely movable or the adhesions have been absorbed, the organ can be maintained in its proper position by a suitable pessary. It should, however, be recognized that the physician must be able to replace the uterus in its proper position before employing this instrument. The pessary does not act as a corrective agent, but only as a crutch to support and maintain the uterus in its corrected position. The pessaries are generally made of soft and hard rubber, sometimes of wire coated with soft rubber. The soft-rubber instruments absorb the discharges from the vagina, decompose, become exceedingly foul, and cause a very disagreeable odor. During the time the pessary is worn it is important that the vagina should be daily irrigated. Solutions of the inorganic salts should not be employed for irrigation, for they are likely to become deposited upon the surface of the

pessary, cause it to be rough, and thus lead to abrasion and ulceration. Care must be exercised in the employment of the pessary that it shall not be either unduly large or too small. An overlarge instrument makes pressure upon the surfaces of the vagina, causes ulceration and the formation of granulations, which may envelop a large portion of the pessary and finally cause it to become embedded in cicatricial tissue. Too small an instrument permits the uterus to fall back over the pessary, or the pessary itself to be twisted around and thus prevent it being of any service.

447. Summary.—In anteversion and anteflexion of moderate degree, constitutional measures for the improvement of the general health, the regulation of the secretions, enforced rest during menstruation, with dilatation, curetment, and the establishment of proper drainage will be means sufficient to establish a symptomatic cure. When the anteflexion is acute and dysmenorrhea is marked, curetment will generally be of only temporary benefit and should be followed by splitting the posterior lip and suturing the surfaces as advised by E. C. Dudley. Retroversion and retroflexion are capable of producing marked influence upon the general health, but should not be considered as indicating the practice of special procedures unless they are productive of symptoms. The correction and maintenance of the uterus in its proper position is indicated as a preliminary treatment of any complication, and retroversion, associated with subinvolution following a recent parturition, unless complicated by perimetritic adhesions, should be considered an indication for the use of the pessary, but the previous replacement of the organ must be a *sine qua non*. In retroflexion, if the pessary is not well borne and the uterus is freely movable, the Alexander operation may be employed. The great frequency with which inflammation and more or less adhesion of the uterus occurs greatly limits the number of cases to which this operation is applicable. Indeed, I would prefer to make the median incision, for it enables us to thoroughly examine the condition of the pelvic viscera, to break up existing adhesions, and to treat diseased conditions of the ovaries and tubes. As already seen, the great majority of operations for shortening the round ligaments within the abdomen utilize the strongest portion of the ligament and leave the weakest undisturbed, with the probability of a redevelopment of the condition. The operation devised by Gilliam and Ferguson seems to me the most desirable, as it accomplishes all that the Alexander operation could do. Moreover, it has the advantage over the operation of ventrosuspension in that it affords no opportunity for the formation of adhesions which may serve as a trap by which a knuckle of intestine

may become fixed and obstructed. My experience leads me to the performance of the operation known as ventrosuspension or ventrofixation less and less frequently. Of the vaginal operations, the one devised by Vineberg is the most serviceable. The other vaginal operations have proved unsatisfactory, for many of the patients thus operated upon have experienced trouble during a subsequent pregnancy. Prolapsus uteri is a condition which should receive early consideration. The longer the displacement is permitted to remain unantagonized, the greater are the chances that it cannot be completely restored. The first stage of uterovaginal prolapse can be corrected by the employment of a suitable pessary. One should be employed which will maintain the uterus in a position of anteflexion or anteversion. The early stage of vagino-uterine prolapse should be considered an indication for the prompt retraction of the relaxed vaginal walls and the restoration of the perineum. The accompanying cystocele should be treated by an excision of the redundant vaginal portion of the septum. This surface should be sutured in a transverse direction in preference to the suture that is sometimes advocated, known as the Stolz suture, which shortens the vagina in every direction. The importance of having a long anterior vaginal segment is seen in its influence in maintaining the cervix at a higher level, consequently throwing the fundus forward. In the later stages of prolapsus, the vaginal plastic operation should be supplemented by an abdominal procedure to maintain the organ forward. This may be accomplished by shortening the round ligaments. After the climacteric, especially when the uterus shows a marked tendency to descent, fixation of the organ is desirable. In very extensive prolapsus or in elongation of the supravaginal cervix the fundus uteri should be amputated, and the stump can then be secured to the upper part of the broad ligament or to the anterior abdominal wall. Very frequently the condition will be complicated by an extensive hernia through Douglas' pouch, when an extensive vaginal plastic operation, combined with a ventrofixation, will not necessarily prevent the development of this condition. The hernia may be obviated, however, by suturing together the fold of Douglas over the rectum and the remaining part of each fold to the side of the rectum. Enteroptosis may be still further prevented by fastening the colon to the abdominal parietes. My experience has led me to condemn the Freund operation as one of no value.

448. Inversion of the Uterus.—Inversion of the uterus is that condition in which its inner or mucous surface is outside and its internal or peritoneal surface within. Inversion can be partial or complete, and presents three different degrees:

In a partial inversion the body of the organ is depressed and inverted until it reaches the cervix, but without dilating the latter, when it is known as the first degree, or *inversion intrauterine* (Fig. 402). Next, the fundus protrudes through the cervix, the cervix being turned down upon the neck like a cuff, which is the second degree, or *inversion intravaginal* (Fig. 403). In the third degree the entire uterus is inverted, and with it, not infrequently, the vagina, the uterus hanging outside the vulva, and this is known as *inversion extravaginal* (Fig. 404). Now, every degree of this form of alteration of the uterus can combine itself with a partial or total inversion of the vagina

Fig. 402.—Partial Inversion of the Uterus, showing Three Degrees.

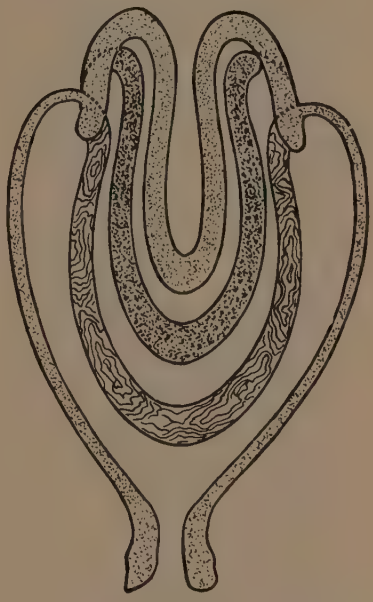


Fig 403.—Intravaginal Inversion; Three Degrees.

so the view that the third degree only is necessarily combined with prolapsus is a mistake. A trifling degree of inversion or partial turning in of the uterus is called *invagination*. This may be a mere depression, over which the mucous surface becomes convex, while the peritoneal surface forms a depression or concavity. As this depression continues, the proximity of the tubes and round ligaments to the ligamentum ovarium draws these structures into the opening. The ovaries may rest upon the funnel-shaped depression, while the tube is necessarily, for a part of its extent, drawn into the cavity. The cavity, with its

enlarged opening in the peritoneal cavity, is called the inversion funnel. This funnel is usually not quite the depth of the ordinary length of the uterine cavity. If the inversion continues for some time, secondary phenomena result, from retrogressive processes, but the uterus returns to its normal size. The inverted mucous membrane is covered with epithelium; the neck of the uterus is small, generally surrounded by a cuff of tissue, derived from the cervix, which has not been completely inverted—a cervical ring. The longer the inversion exists, the more considerable is the congestion, edematous enlargement, and thickening, which form the misproportion between the narrow inversion funnel and the enveloping cuff of the cervix. We not infrequently find diseases of the adnexa. The orifice of the tube situated in the vagina can readily be the avenue for the passage of infection into the deeper structures. The uterine inner surface of the tubal mouths is exposed, the projecting mucous membrane is frequently rubbed and irritated, so this door stands open for the entrance of germs, and infection can take its way through the tubal mucous membrane or by the lymphatics to the deeper tissues, producing endosalpingitis, suppurative processes in the ovary, or purulent pelvioperitonitis by extension of infection from the connective tissue. In ordinary conditions we can have involvement of the cellular tissue from such infectious processes. Alterations in the peritoneal covering of the inversion funnel occur, which render the condition more or less fixed.

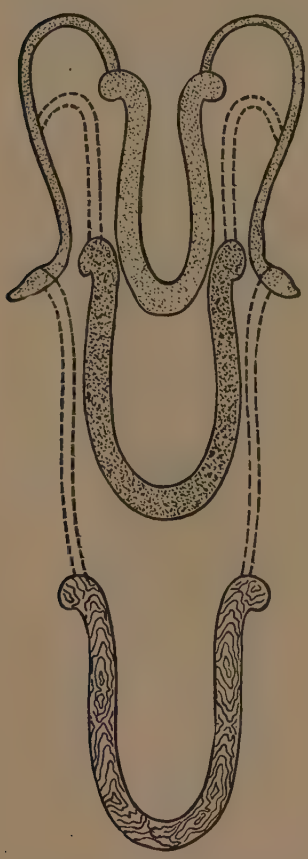


Fig. 404.—Extravaginal Inversion; Three Degrees.

449. Etiology.—Inversion generally arises from two causes: first, from puerperal conditions, relaxation, or partial paralysis of the uterus during the process of labor, especially the third stage of labor; and, second, the nonpuerperal form, in which the uterus is displaced by the presence of a fibroid tumor attached to the fundus. (Fig. 405.) These two conditions are

very much alike in the clinical form of an inversion, but are very different in their manner of development. Puerperal inversions are much more frequent than those which arise from the presence of growths. They are in the proportion of nine to one. Total inversion is rare. How much more frequently the partial form occurs is difficult to determine, as not infrequently partial inversion resulting from the presence of growths is overlooked. Puerperal inversion, in some cases, is produced by traction upon the cord in the efforts to deliver the placenta; by faulty pressure over the uterus the fundus may be inverted, and in the paralyzed condition may be grasped by the deeper structures and the inversion progress until it is completed. A short cord is an occasional cause for inversion. When the ominous traction is made upon the cord, the uterus is relaxed. The traction upon the fundus, and the subsequent uterine contraction, can more rapidly effect the displacement. Inversion rarely occurs spontaneously. The overdistention of the cervix by a large fetus frequently causes such relaxation as will permit inversion to occur readily. It will be a matter of interest to know whether, in the cases in which inversion has occurred, the placenta has been attached near the fundus of the uterus.

Fig. 405.—Nonpuerperal Inversion. Fibroid Tumor Attached to the Fundus Uteri.

450. Symptoms.—Inversion causes characteristic symptoms. The patient generally complains of severe pain, which is continuous, sometimes for days; sometimes a pulling sensation is felt in the vagina. Immediately following the dislocation a severe hemorrhage occurs. This continues in noteworthy strength the first day of the puerperium, and does not completely disappear, but may continue much longer. Later, it appears intermittent, but the suspension of discharge rarely corresponds in its duration to the normal intermenstrual interval. During

the interval there is a profuse mucous discharge from the genitalia. The profuse blood discharge can cause the death of the patient from acute anemia, or later from septic infection. In some cases spontaneous reinversion may take place in the course of the year. The condition may be suspected from these phenomena.

451. Diagnosis.—Inversion will be suspected from the severe pain, the more or less continuous hemorrhage, and the absence of the fundus uteri when the hand is placed upon the abdomen. Digital examination discloses a globular mass which fills up the

Fig. 406.—Palpation of an Inversion of the First Degree.

vagina and is encircled by a cuff-like ring at its upper part. This ring is situated at the external os. (Fig. 407.) Placing the hand over the abdomen and making deep pressure, the fundus of the uterus is found to be absent from its normal situation, and, instead, a funnel-shaped excavation is recognized, which is ordinarily sufficient to determine the diagnosis. (Fig. 408.) In the chronic condition the uterus resumes its normal size, presents a globular or pear-shaped mass in the vagina, surrounded at its upper part by a distinct cuff or ring, and the sound

will pass into this the same distance on all sides. Bimanual examination discloses above, a funnel-shaped depression. This depression can be more readily determined by drawing upon the fundus of the uterus and introducing the finger into the rectum, when it can pass over the neck and directly into this funnel. The ovaries and tubes are recognized near it or upon its margin. By investigation with the speculum the vaginal tumor is smooth,

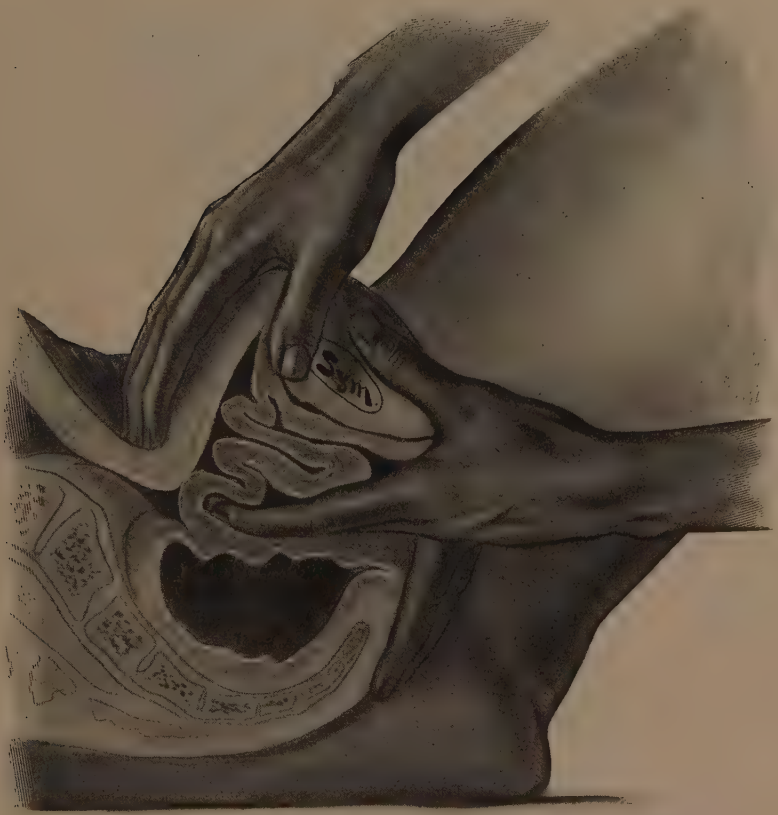


Fig. 407.—Palpation of an Inversion of the Second Degree.

glistening, highly reddened and sometimes at its lower angles the openings of the tubes can be recognized. While a vaginal examination may afford a suspicion of the character of the disorder, the diagnosis is incomplete without a bimanual investigation which involves the rectum and belly cavity. When the abdominal walls are very thick and palpation is not readily determined, the introduction of a sound or a catheter into the

bladder and of a finger into the rectum enables us to determine definitely the presence or absence of the uterine body. Inversion of the uterus is sometimes confounded with fibroid polypus which has been extruded into the vagina. (Fig. 409.) A fibroid polypus may have a broad-based pedicle and the tumor may present a shape very similar to that of an inverted uterus. As it is covered with mucous membrane the superficial similarity may be marked. Of course, a fibroid tumor will show no orifice of the

Fig. 408.—Appearance of Inversion of the Third Degree.

Fallopian tubes, but the latter are not always distinguished. Sensation in the fibroid is a little less marked than in the inverted uterus, but is not sufficiently definite to afford a foundation for diagnosis. The sound carried around the cuff of the inverted uterus passes on all sides an equal distance. With fibroid tumor it would pass into the uterine cavity at one side. (Fig. 409, *b*.) Occasionally, however, the cavity of the uterus may be so stenosed

that the sound will not enter, and the diagnosis may then be uncertain. (Fig. 409, *c*.)

If we grasp the mass and draw it down, the finger in the rectum will disclose, in the one case, the cup-shaped depression of the inverted uterus; and, in the other, the body of the uterus lying above the neck of the growth. In a partial inversion, associated with fibroid growth, we may not be able definitely to determine the condition until we proceed to operation for the removal of the mass. (Fig. 410.)

452. Treatment.—There is a difference in the treatment of the two forms of inversion. In the puerperal condition all that

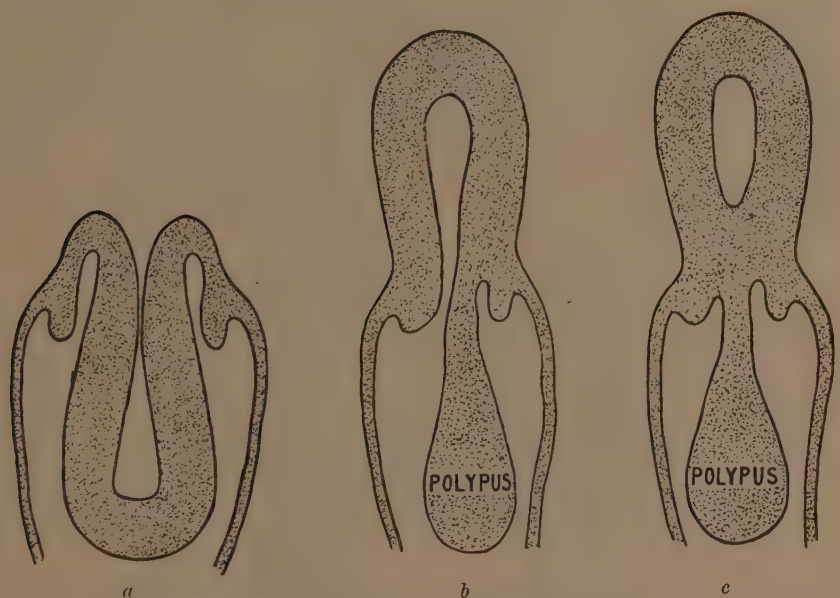


Fig. 409.—*a*. Inversion of the Uterus. *b* Fibroid Polypus. *c*. Fibroid Polypus, with Stenosis of the Cervical Canal.

is necessary is to replace the uterus, when it will remain, while in the nonpuerperal form it is necessary to remove the growths which have occasioned it. Reinversion is comparatively easy in recent cases. Pressure against the fundus with the hand or fingers in the shape of a cone will be frequently sufficient to carry the hand directly into the cavity of the uterus and to accomplish its complete reinversion. After the puerperal condition becomes chronic we then have to resort to various methods for replacement of the organ. These methods consist in manual treatment—instrumental and operative. In the manual treatment the fingers exercise a veritable taxis on the inverted organ,

just the same as in hernia, and the two hands are necessary for treatment, in which they play an essentially distinct rôle. The

Fig. 410.—*a*. Submucous Fibroma. *b*. Partial Inversion. *c*. Partial Division of the Uterus.

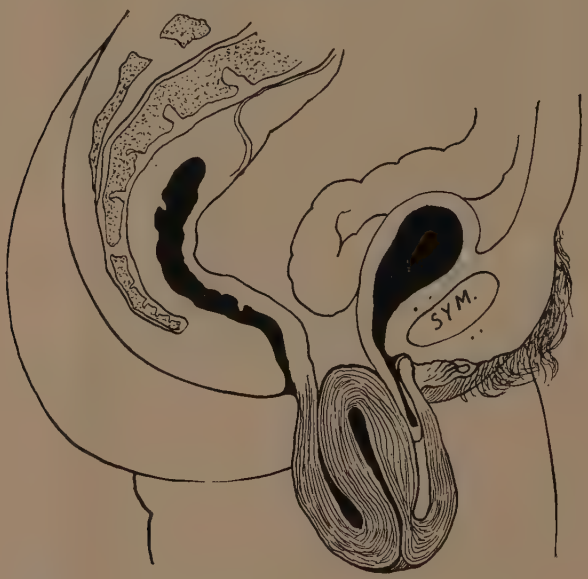


Fig. 411.—Prolapsus Uteri without Inversion.

left hand over the abdomen maintains the uterus, while the

right replaces the inversion. Courty introduces one or two fingers into the rectum and hooks them over the end of the uterus, which fixes it more solidly. The other hand is introduced partly or totally into the vagina. The method of taxis is exercised in various directions; thus, it is central, lateral, or peripheral. The taxis is called central when the pressure is made against the fundus, or median part of the organ (Fig. 413); lateral when it is exercised at the level of one or the other uterine cornu (Fig. 414); and peripheral when the pressure is exerted on the reflex parts (Fig. 415). The latter is exemplified when we grasp the fundus in the palm of the hand, pass the fingers to the fundus of the vagina, and spread it out, stretching the funnel

Fig. 412.—Inversion of the Uterus—Extravaginal.

while the fundus is pushed against it. If taxis has been tried and found inefficient, we can then resort to instrumental reduction. A number of instruments for this purpose have been devised. The air pessary of Gariel is introduced and distended. It exerts a hydrostatic or aërostatic pressure against the fundus, and pushes it upward, while the vaginal walls, by their traction, pull apart the cervix. This soft pressure in some cases may be sufficient to accomplish the gradual reduction of the organ. The pessary can be introduced and the bandage so applied as to maintain the pressure against the cervix (Fig. 416). A vaginal tampon of iodoform gauze for twenty-four hours is sometimes

more effective than the pessary. The pressure is sometimes employed against the fundus by having an instrument with a cup-shaped end, into which the fundus fits, and a spring upon its external surface by which an elastic pressure is induced. (Fig. 417.) This procedure is more effective when combined with Marcy's suggested insertion of two or more ligatures in the cervix, by which traction can be made upon it, while pressure is made against the fundus. Thomas advised opening the abdomen and dilating the cervix with an instrument similar to a glove-stretcher, while pressure is made against the fundus.

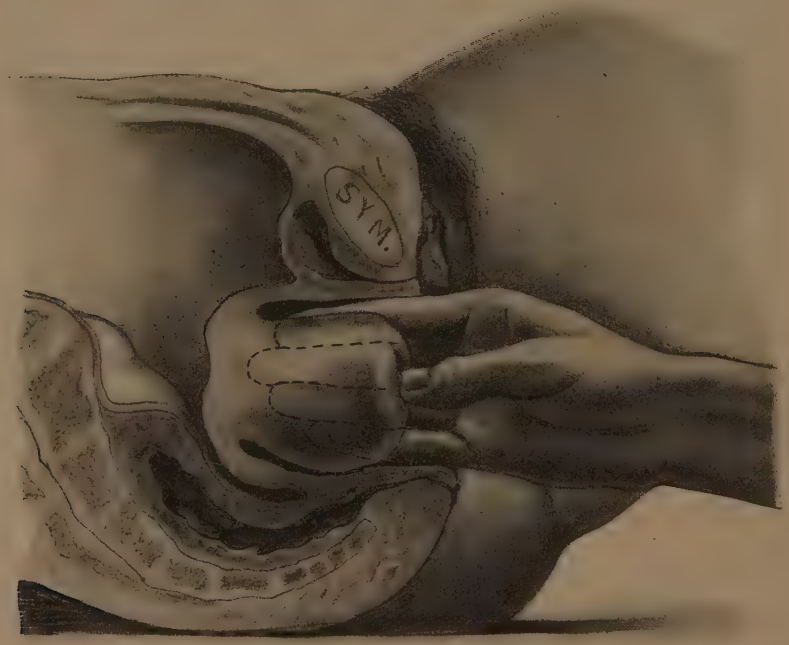


Fig. 413.—Central Taxis.

(Fig. 418.) This procedure was successful in one case and fatal in another. It has been suggested to introduce the index-finger of one hand into the rectum, and that of the other into the bladder, hooking them into the funnel-shaped depression of the uterus, while the thumbs are pressed against the fundus. Küstner advocates making a transverse incision through the posterior fornix of the vagina into Douglas' culdesac, through which he presses the index-finger of the left hand into the inversion funnel, and attempts with the thumb of the same hand to press up the fundus. If the procedure fails, he advises splitting through the

posterior uterine wall, in the median line, by a longitudinal incision, which may extend to within two centimeters of the fundus, from the mucous surface to the peritoneal. (Fig. 419.) The renewal of attempts at reinversion under such circumstances is usually successful, for the reason that the resistance is removed and we are consequently enabled to replace the organ. After the uterus has been reinverted the fundus is turned down through the vaginal opening and a number of sutures are introduced to close the incision. Hirst advises a cut through the vaginal portion of the cervix only. Cases have been recorded of spontaneous reduction of the inversion when the vulva has been distended

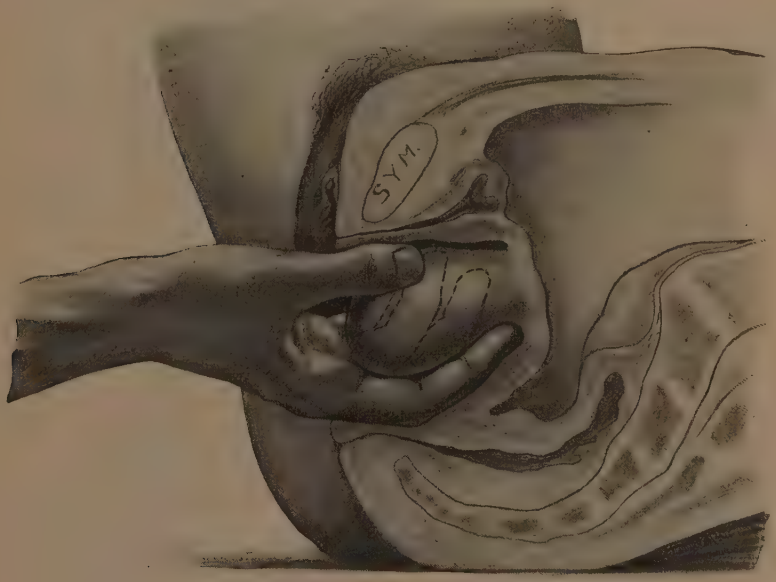


Fig. 414.—Lateral Taxis.

with the patient in the genupectoral position. If the conditions are unfavorable for an operation of reinversion, we can proceed to total extirpation of the uterus or to amputation of the inverted fundus. When the amputation of the fundus only is made, it is very important to guard against reinversion of the stump with a resulting hemorrhage into the peritoneal cavity. The stump may be secured by three or four partial ligatures, and then the amputation may be made below them. When the inversion is produced by the presence of tumors, we may content ourselves simply with the removal of the growths and the reinversion of the organ; or when the organ is very extensively involved, it

may be necessary to remove the fundus with the growth. The possibility of partial inversion should always be kept in mind in operating upon partial extrusion of growths from the uterine cavity. Numerous cases are recorded in which a fibroid polypus or growth has been removed by the wire écraseur, and examination subsequently disclosed that a portion of the uterine wall was removed, causing an opening into the abdominal cavity. With growths projecting into the vagina, the preferable procedure is a careful enucleation of the tumor. The tumor is depressed and

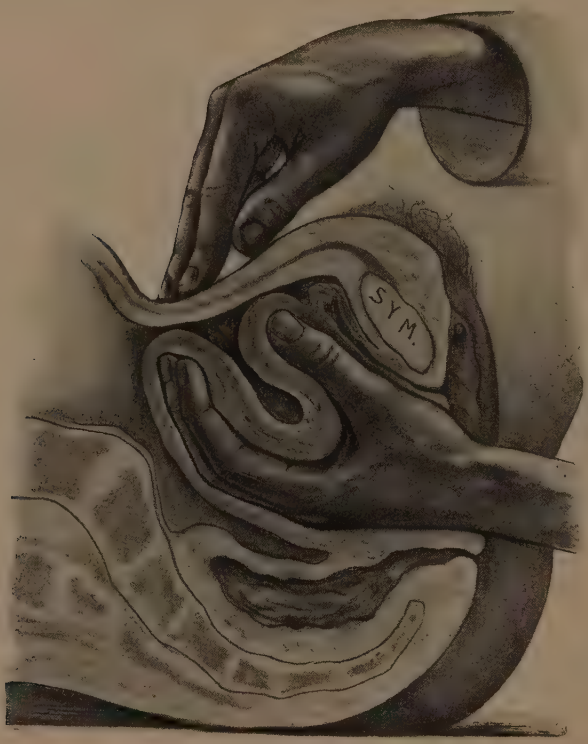


Fig. 415.—Peripheral Taxis.

held while the enucleation is performed under the eye, so that, even though an inversion has occurred, by hugging the tumor closely we prevent breaking through the wall of the uterus.

453. Displacements of the Appendages.—Displacements of the ovaries and tubes are very common with backward uterine displacement. Inflammatory troubles in the tubes cause them to drop down, from increased weight, and they are found behind the uterus in Douglas' pouch (Fig. 420). Frequently both tubes

may be situated in this position, and, united at their abdominal ends, form a single tumor, which contains pus or serum. The tubes are dislocated by their attachment to growths; ovarian,

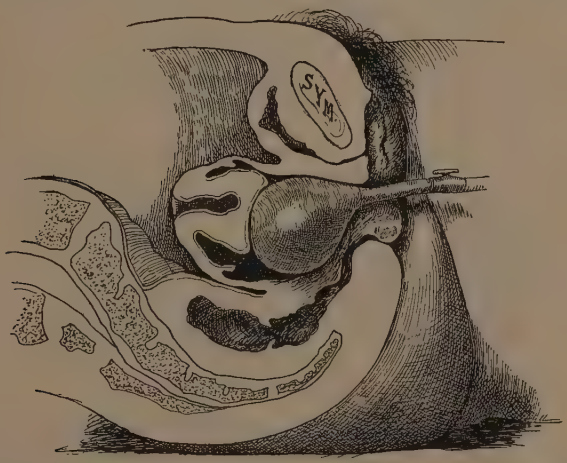


Fig. 416.—The Use of the Air Pessary to Reduce an Inversion

Fig. 417.—Reduction of Inversion with White's Apparatus.

fibroid, or broad ligament cysts may draw the tube up into the abdominal cavity and almost double its length. The most fre-

quent dislocation of the ovaries is downward, into Douglas' culdesac. This prolapse can occur as a consequence of retrodisplacement, or, independent of it, from elongation or rupture of the infundibulopelvic ligament. The dislocation can be occasioned by enlargement of the ovary, or the hypertrophy may be secondary to the displacement. The complication of retrodisplacement with ovarian prolapse is a source of additional distress and annoyance to a patient, as the tender ovarian struc-

Fig. 418.—Intraperitoneal Dilatation of the Uterus.

tures are subject to pressure from the heavy uterus and from the passage over them of the contents of the bowel. In this situation they are also subject to pain and distress during the act of coition, often rendering it so painful that the act is dreaded by the patient.

454. Symptoms.—Prolapse of the ovary is generally associated with chronic inflammation, either as a primary or secondary condition. The symptoms from which the patients suffer are

necessarily those which to some degree are occasioned by the chronic disorder. In addition to this fact, however, the patient suffers distress during fecal evacuation, during the act of coition, in walking, and on standing. The ache and distress are sometimes so severe as to render the patient unable to assume or retain the upright position; a condition of semi-invalidism from the influence upon the nervous system is engendered similar to

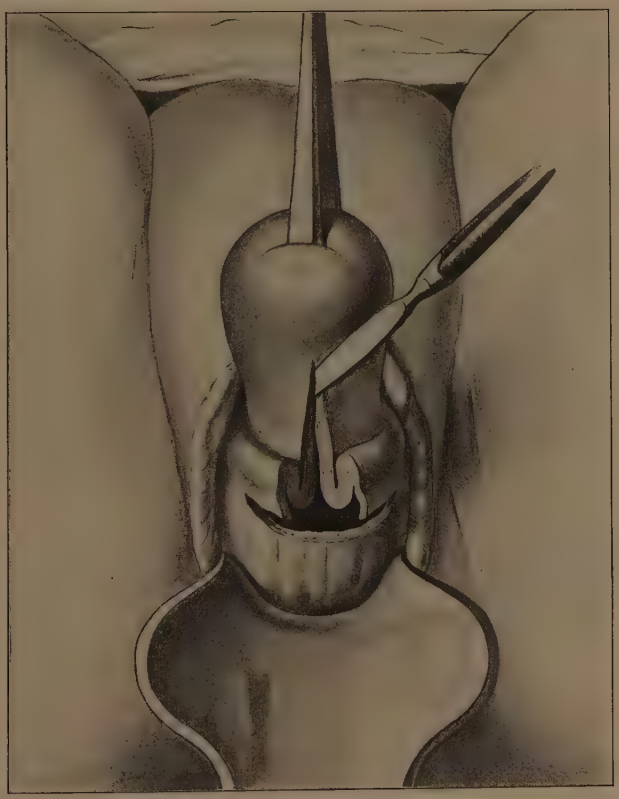


Fig. 419.—Incision of the Posterior Uterine Wall Preliminary to Reduction of an Inversion.

that present in chronic ovarian inflammation. There are no symptoms characteristic of tubal displacement.

455. Diagnosis.—Prolapse of the ovary, when freely movable, is readily determined by bimanual palpation. A mass can be felt posterior to the uterus in Douglas' pouch, which varies from the size of an almond to that of a small orange. These masses can be pushed up, and, as they arise in the pelvis, fall toward the

side corresponding to the affected ovary, and drop backward as soon as the force is removed. When the ovary is enveloped with inflammatory exudate in the pelvis, it is more difficult to determine its situation, and, in fact, it may not be discovered until after the abdominal cavity is opened. Tubal enlargement with adhesions can frequently be mapped out as extending around the side of the uterus on its posterior surface, and the organs are more or less fixed.

456. Treatment.—In inflammatory conditions of the tube involving the ovaries the treatment is the same as that of the diseased condition, as described in Section 399. Prolapse of the ovary associated with chronic ovaritis, in which the ovaries are very much enlarged, is best treated by extirpation. When the enlargement is simply due to prolapse, causing more or less ovarian edema, the organ should be brought up and fixed in its proper position. Frequently shortening the round ligaments or ventrofixation will bring with it the restoration of the position of the ovaries. When these, however, do not rest upon the posterior surface of the broad ligament, but drag backward into Douglas' pouch, the infundibulopelvic ligaments should be shortened or the external end of the ovary should be stitched to the posterior surface of the broad ligament near its upper part. Efforts have been made to maintain the ovary in its restored position by mechanical means, but in my experience they are usually ineffective. The ovary slips behind the pessary, though it have a thick bar, becomes pinched, and adds to the distress of the patient. Frequently the ovary will be caught behind the instrument, and the patient will be unable to move for a few minutes, owing to the severe pinching of the inflamed organ.

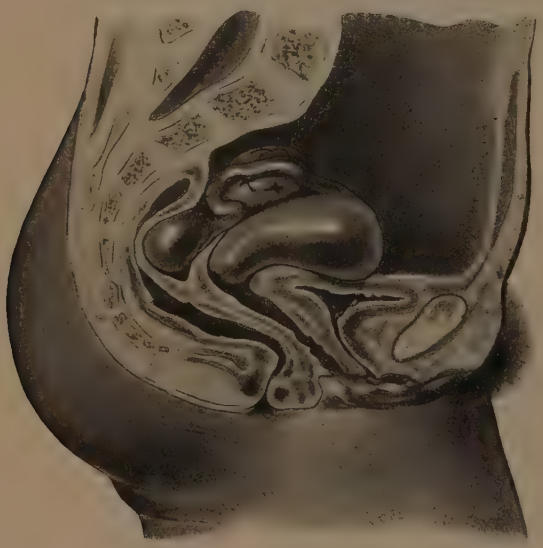


Fig. 420.—Prolapsus of Ovary and Tube behind Uterus.

GENITO-URINARY HEMORRHAGE AND ECTOPIC GESTATION.

457. Hemorrhage a Symptom.—The advisability of considering hemorrhage under a separate heading or division when it must be recognized that under all circumstances its presence is an indication of the existence of disease rather than the actual palpable disorder may be questioned, but my experience has caused me to believe that in the diseases of women the gravity of this symptom is not always fully appreciated, and that this failure will be better overcome if the subject is given the importance of a separate consideration.

458. Site and Varieties.—Hemorrhage may arise from any portion of the genito-urinary tract and from the vessels within the adjacent cellular tissue. It can occur at any age, though it takes place but rarely, except from trauma, prior to puberty. The significance of hemorrhage is largely dependent upon the age at which it makes its appearance. The hemorrhage is called open when the blood escapes from the urethra, vagina, or through external injuries; concealed, when within the abdominal cavity or in the cellular tissue. In the latter, also, it may be denominated as circumscribed. A discharge of blood mixed with urine is known as *hematuria.* An excess of bloody discharge synchronous with the regular menstrual period is named *menorrhagia;* while bleeding of an irregular character is named *metrorrhagia;* a collection of blood in the cellular tissue is known as a *hematoma;* when in the tissues of the vulva or vagina it is called a *vulvovaginal thrombus* or *hematoma;* into the cellular tissue about the uterus, an *extraperitoneal hematocele;* an accumulation within the peritoneal cavity, which is encysted or closed in by peritoneal adhesions, is described as an *intraperitoneal hematocele;* hemorrhage into the structure of the ovary, when small, is known as an *ovarian apoplexy;* and when large, or frequently repeated, so the ovarian stroma is practically destroyed, and the collection forms a blood cyst, it is called an *ovarian hematoma.* A collection of blood in one of the hollow organs is known, in the Fallopian tube, as a *hematosalpinx;* in the uterus as a *hematometra;* and in the vagina as a *hematocolpos;* or when the collection is so large as to involve all, it is denominated a *hematocolpometrosalpinx.* Further distinctions are retro-uterine, circumuterine, and ante-uterine hematocele, according to the situation of the blood collection—behind, about, or in front of the uterus.

459. Hematuria and Its Causes.—Hematuria is blood mixed with the urine, and is engendered by urethral caruncle, polypi, vegetations, fissures (the latter situated about the internal

meatus), and malignant disease of the canal. It occurs in acute and chronic cystitis, associated with more or less vesical ulceration; in the aggravation of the disorder occasioned by the presence of vesical calculi; and malignant growths or villous projections from the vesical mucous membrane are a prolific source for the occurrence of blood in the urine. It is often produced by injury, inflammation, or malignant disease of the ureters or kidneys. Stone in the pelvis of the kidney frequently causes bloody urine. Occasionally, blood appears in the urine as a result of constitutional conditions. So frequently is it associated with malarial infection as to give rise to the term malarial hematuria.

460. Symptoms and Diagnosis.—The blood may be mixed with the urine, giving it a dark, smoky, often almost black appearance, or may precede or follow the act of micturition, as a few drops of free blood mixed with the urine or in the form of a small clot. The clots may be bright and recent, or darkened by longer retention within the urine. Unmixed blood comes from injury or disease of the urethra; frequently a few drops or a small clot will follow urination when caused by a fissure of the meatus. When the bleeding is occasioned by disease or injury of the bladder, the urine is not constantly bloody. An evacuation may be perfectly clear and the next be bloody.

The cause of the symptom is ascertained by careful examination. Disorders of the urethral orifice are recognized by inspection of the canal, by palpation, and, if necessary, by inspection through an endoscope or a urethral speculum. A fissure at the internal urethral orifice causes severe pain upon palpation of the urethra.

Inflammation of the bladder—cystitis—is recognized by painful and frequent micturition and attacks of profuse bleeding. The microscope reveals the cellular elements of the blood and degenerating epithelium in the urine. In growths or foreign bodies palpation discloses thickened walls, increased tenderness, and possibly the mobility of a foreign body or calculus. Microscopic investigation of the fluid evacuated is of great value. Not infrequently the bladder may be the seat of profuse bleeding, which becomes coagulated, and the clots interfere with the collection and evacuation of the urine.

Disease of the ureter and pelvis of the kidney may produce bloody discharge. Irrigation of the bladder permits the character of the urine from the kidney to be determined. Through the speculum the ureteric orifice will often be seen as a pouty, more or less abraded elevation, from which bloody urine is seen to issue. Catheterization of the ureter will determine the character of the secretion in the respective kidneys, and the existence

of disease in one or both of the organs. Calculi in the renal pelvis are generally a source of pain in the region of the kidney. The pain is generally felt along the course of the ureter, not infrequently over the distribution of the genitocrural nerve.

461. Treatment.—The treatment of hemorrhage is the same as that of the condition producing it. Hemorrhage from the bladder and urethra must be recognized as of importance. Measures for its relief (Section 340) have been described.

When trouble can not be discovered in the urethra and bladder, the treatment should be directed to the disease in the pelvis of the kidney. Before proceeding to internal measures, constitutional conditions should be excluded. If necessary, the blood should be examined for the presence of the malarial plasmodium. The determination of malaria should indicate the use of antimalarial remedies. Bleeding may be arrested by the employment of astringents—tannic and gallic acids, hydrastis, and hamamelis. Tyson advises ferri persulph., gr. $\frac{1}{4}$–$\frac{1}{2}$, as very effective.

Continuation of bleeding associated with renal calculus should indicate operation for its removal. Operation will be conservative, for the continuance of the disorder necessarily results in renal degeneration and destruction.

462. Genital Hemorrhage or Bleeding.—This term is employed to distinguish bleeding which makes its exit externally and can arise from any portion of the genital tract. Bleeding of slight character,—a few drops,—which will occasionally soil the clothing, will be a source of great anxiety to a nervous patient and should be considered an indication for a careful investigation by her physician. Such bleeding may arise from irritation of the vulva, warty growths, scratching induced by pruritus, from caruncle of the urethra, papillary growths and granulations of the vestibule or vaginal mucous membrane, lacerations, abrasions or erosions, or beginning malignant diseases of the vagina or cervix, inflammation of the endometrium, or changes incident to gestation or parturition. More severe bleeding or hemorrhage is induced by injuries of the vulva caused by falling and striking against a sharp object, or by kicks or blows; these injuries cause very severe hemorrhage when the bulb of the vestibule is injured. Hemorrhage is also incident to malignant disease of the labia or clitoris, severe injuries of the vagina, or extensive lacerations of the cervix. Interstitial endometritis, fibroid growths encroaching upon the uterine cavity, and epithelioma, carcinoma, and sarcoma of the uterus are frequent causes. Hemorrhage from the genital tract may also result from disease outside of the canal which interferes with its circulation; as inflammatory exudate, cellulitis compressing the vessels of the pelvis and

interfering with the return circulation, displacements, extra-uterine pregnancy, intraligamentary tumors of the ovary or of the uterus, inflammation of the Fallopian tubes, chronic inflammation of the ovaries, and constitutional conditions which affect the circulation in the uterus (as, disease of the heart, of the kidneys, or of the liver). The circulation is very often temporarily influenced by the development of zymotic diseases. Severe uterine hemorrhage may occasionally usher in an attack of typhoid fever. Disturbance of the process of gestation by hemorrhage may indicate the occurrence of abortion or of premature labor, or may follow abortion or labor where the secundines or portions of the placenta are retained.

463. Diagnosis.—The determination of the existence of hemorrhage, of course, presents no difficulty. It is exceedingly important, however, that we should be able to recognize its etiology and source. This will often be found a difficult question. No physician does justice to his patient who permits her to bleed without subjecting her to a careful examination in order to ascertain the cause. Not infrequently patients will object to the necessary examination. Such a patient should be plainly given to understand that the physician can not continue to treat her unless she affords him an opportunity to know the existing conditions. He will do himself less injury by absolutely refusing to treat the case than he will if he yields to the patient's objection and endeavors to palliate an unrecognized disease. Unfortunately, many patients have an idea that hemorrhage at or near the climacteric is a condition to be expected, so if free bleeding occurs at this period, they attribute it to the coming change of life and continue to endure it. Members of the medical profession, I find, are often responsible for this misconception, for frequently they advise the patient that the bleeding is incident to her period of life, and that, therefore, when this has passed over, the hemorrhage will cease. Such a statement, however, only calms the patient and favors a transition from the existing to another and perhaps more serious state. Moreover, when the discovery of the actual condition is made, the time for radical measures has elapsed. The occurrence of hemorrhage incident to local or constitutional conditions makes it incumbent upon us to interrogate carefully every organ of the body to be certain of its cause. In every woman who suffers from hemorrhage, where we are able to eliminate constitutional conditions, and where we can discover no disorders in the tissues about the organ or any disease of the cervix to explain the cause, the uterine cavity should be thoroughly explored. The previous history of the patient will enable us to ascertain whether the bleeding is due to the retention of products of a recent gestation.

Bimanual examination will generally reveal even small growths. Such a condition will be manifested by localized areas of enlargement or resistance in the organ. Some of these growths, being pedunculated, can be moved about in the uterine cavity to a limited degree. Combined palpation also affords information as to the possibility of malignant disease. The latter occurs more frequently in the cervix, and when it exists in the body, it causes more or less hardening and sense of resistance from the presence of infiltration. This, of course, depends somewhat upon the associated reactionary inflammation. If the disease involves only a portion of the lining membrane of the uterus without the infiltration extending into the wall, the bimanual examination will not reveal the induration. Therefore it will be necessary to explore the uterine cavity, preferably with the finger. The finger within the uterus and the hand over the abdomen enables one to outline and definitely determine the thickness and rigidity of the wall and the extent of induration as well as the general condition of the uterine mucous membrane. In the nonpuerperal uterus, however, one can not readily employ digital exploration of its cavity without a previous dilatation. Dilatation may be accomplished by a variety of methods, one of which is the employment of mechanical dilators or of graduated bougies. This procedure affords an excellent opportunity for the employment of therapeutic measures within the uterus, but sufficient dilatation of the organ can not thus be secured to allow the introduction of the finger without tearing and inflicting serious injury to the structure of the cervix. The cervix may be split on either side of the internal os with scissors or knife, after which the canal can be dilated or stretched enough to permit the introduction of the finger. Often this method of procedure is associated with an extensive laceration of the uterine structure, and, furthermore, incision of the cervix is too radical an operation for mere exploration. It is only when it is necessary to institute treatment of a threatening condition within the uterine cavity that we would advise cervical incision. Another method of dilatation is that devised by Vulliet, which consists in packing the uterine cavity with pieces of gauze until the cervix becomes gradually dilated, and renewing this gauze packing until the uterine cavity is so well dilated that the finger can be readily introduced. This plan is open to the objections, however, that the gauze is an irritant, requires care that the patient does not become infected during the progress of the procedure, and in many cases, particularly when the cervix is the seat of inflammation and is a little rigid, the dilatation is ineffectually accomplished.

The most effective method of dilating the cervix is accom-

plished by the use of tents. The tents may consist of sponge, laminaria, or tupelo. Sponge tents are objectionable on account of the difficulty of rendering them sterile and because of the fact that they readily become impregnated with the discharges, which quickly decompose and predispose to infection. This danger has in some degree been obviated by the suggestion that the tent be covered with a rubber sleeve, but this requires the employment of special measures to convey the moisture to the tent. The laminaria tents are exceedingly effective, preferably those which are perforated. The tent should be carried into the uterine cavity without much force, the tent and the canal having been previously rendered as far as possible sterile. As large a tent as can be introduced should be employed. When the cavity is somewhat dilated or when the first tent is not sufficiently large, and we wish for more complete dilatation, a number of tents or a nest can be employed. More rapid dilatation is accomplished by previously moderately stretching the canal with bougies. If aseptic precautions are observed, the danger is not thereby increased. The details of the procedure and the precautions to be exercised have been given. (Section 77.)

464. Treatment.—The treatment should be directed to the disorder which has caused the hemorrhage. We may not, however, be ready, or the patient can not be subjected to radical treatment, while the hemorrhage is so severe as to necessitate the exercise of measures to save her life. Various remedies are advocated for relief of hemorrhage—agents which exercise contractile power upon the involuntary uterine mucous membrane, of which ergot is one of the most efficient. It not only causes contraction of the uterine muscle-wall, but also decreases the amount of blood that is sent into the uterus through the contraction of the uterine vessels. Thyroid extract and the extract of mammary gland have been highly extolled. The various astringents are of benefit, as gallic and tannic acids; dilute sulphuric acid; iron salts, especially the persulphate of iron; hamamelis; hydrastis and its salts, hydrastin and hydrastinin; and the tincture of cinnamon. The latter may be given with good effect in combination with either gallic or tannic acid, giving from ten to thirty grains of the acid with a tablespoonful of the liquid. The patient should be kept perfectly quiet in bed; if hemorrhage is severe, she should be interdicted from rising even to evacuate the bowels or to void the urine. Cold applications may be made to the abdomen, and heat or a mustard plaster applied between the shoulders, in order to divert the current of blood from the pelvis. Local applications of various astringents, such as alum, zinc sulphate, hydrastis, or hamamelis, used in strong

solution or as a douche, may be employed. Douches of hot water should be given the patient while in the recumbent position, using water at from 110° to 115° F., even 120° F. if the patient can bear it. Applications to the uterine canal by injecting a few drops of perchlorid of iron may be employed, or the cavity may be swabbed with it. The objection to the injection is that the uterine cavity will contract upon its contents, causing contraction of the cervix, by which the contents are forced from the uterine cavity into the tubes, and produce inflammation within them, or, worse, a localized peritonitis. Gersterberg employs a strong solution of formol upon a cotton-wrapped applicator. A solution of aluminium acetate has been advocated. When hemorrhage is severe, endangering the patient by its continuance, the uterine cavity should be tamponed, by packing a good-sized piece of gauze firmly into its cavity. This prevents the further discharge of blood and facilitates the dilatation of the canal until it can be explored. These measures for the treatment of hemorrhage are merely palliative. They do not correct the fault or the trouble which induced it; and the earlier radical treatment can be instituted, the better it is for the patient and the more readily is the condition controlled. Slight bleeding from the vulva and vagina is readily controlled by making applications of an astringent or a styptic, such as persulphate of iron, directly to the diseased surface. The cavity should be packed, in order to secure further improvement through pressure. When bleeding occurs from an injury to the vulva, the most efficient means is to enlarge the external injury and to secure the bleeding vessel by ligation. When a large surface bleeds, the hemorrhage is best controlled by packing with iodoform gauze, making firm pressure upon or into the wound. Atmocausis, or the application of steam to the uterine cavity by a special apparatus, has had many advocates, but it would seem desirable to employ more controllable measures, for it is impossible to accurately regulate the amount of destruction to which the uterine mucosa will be subjected, and to definitely equalize its distribution.

465. Vulvar Hematoma or Hematocele.—Vulvar hematoma or thrombus is a term applied to hemorrhage which takes place into the tissues of the vulva. It arises as a result of injury sufficient to cause rupture of a vessel without a break in the integument. When the injury involves the bulb of the vestibule, the hemorrhage may be extensive, and cause a large-sized tumor, which involves one or the other large labium. It also occurs from rupture of varicose veins or from compression of vessels during the progress of labor. The latter is the most frequent cause. The tumor may attain the size of an orange or even of

the fist, and may be very tense and painful. It usually occurs suddenly, and is associated with more or less burning and pain in the region of the swelling while it develops. When the skin is unbroken and the collection does not become infected, it may be completely absorbed.

466. Vaginal Hematoma or Thrombus.—This condition, uncomplicated, is of rare occurrence. It is usually associated with hemorrhage into the vulvar tissue, forming a vulvovaginal thrombus. It usually occurs upon one side of the vagina, and is most frequently a result of injuries sustained during labor. The exciting agent is the passage of the presenting part of the child, which frequently pulls off and stretches the vaginal attachments. This causes rupture of the vessels and severe bleeding. The tumor may attain a very large size, compress the vagina and rectum, and cause difficulty in micturition. The physician may be in doubt, when called to see such a patient, whether it is an accumulation of blood or a suppurative process. The better plan of procedure is, of course, to make a careful examination. With the history of the patient in mind, we may be able to eliminate the probability of it being inflammatory, especially when it occurs shortly after a confinement. During the year 1898 I saw a patient, thirty-four years of age, three weeks after her first confinement, who had passed through a normal labor. She had, however, sustained a slight laceration of the perineum, which was repaired. Two weeks subsequent to her delivery she developed some elevation of temperature, with more or less distress in the pelvis, and examination disclosed a large swelling which compressed the vagina and rectum. The mass thus formed was quite large; the right buttock was edematous and the mass protruded into the vagina to such a degree as greatly to obstruct it, as well as to encroach upon the rectum. Sensation of fluctuation was indistinct. The right buttock was so much more prominent than the left and the sensation of elasticity, almost fluctuation, so marked that I decided to incise through it and thus reach the mass, rather than to make an incision from the vagina. The incision into the buttock, however, disclosed that the swelling in it was entirely edematous. Through this incision the levator ani muscle was opened, when there was at once a discharge of a large quantity of bloody fluid and clots. By pressure through the vagina, the mass was readily removed, and the patient looked and expressed herself as feeling greatly improved. A gauze wick was passed through the wound into this cavity with a view to insure drainage and to prevent its premature closing. The gauze was removed at the end of twenty-four hours, and the subsequent progress of the patient was uninterrupted. Another case of this kind came under my

observation in a young woman who had been delivered by forceps. The right side of the pelvis was apparently occupied by a large clot, which bulged into the vagina, protruded into the labium, and gave rise to suggillation of the entire buttock. This mass was incised from the vagina and it was found to extend up into the broad ligament of the right side. The clot was thoroughly turned out and the cavity packed with a large quantity of iodoform gauze. The patient recovered. I have observed one case of vaginal hematocele in which labor was complicated by an ovarian dermoid. The union of this growth with the uterus had been destroyed by previous torsion. The tumor subsequently became engrafted upon the omentum, from which, by a broad band of adhesion, it evidently received its nutrition. It was attached below by folds of the peritoneum, which extended over and to the left of the bladder. In the latter fold, dipping down into the pelvis in front of the bladder and vagina and to the left of the latter, was an extensive collection of clotted blood, which had evidently been produced by pressure upon the inferior attachments of the tumor during the progress of labor.

467. Diagnosis.—Vulvar hematoma is likely to be confounded with edema of the labium and with labial tumors. Its development, however, is too sudden for the latter condition. Edema of the labium is generally associated with other disorders. It is not one-sided. Both labia are involved unless the edema is due to some special cause, in which there is obstruction of vessels or lymphatics on one side only. Vulvar and vaginal thrombi are usually associated, producing the condition already described as vulvovaginal thrombus. The condition generally follows difficult or complicated labors. Pus collections are rarely found in the lateral walls of the vagina, but are most frequently pushed into the vagina from the posterior fornix. Thrombi, on the other hand, are frequently found upon the lateral surface and rarely affect the posterior vaginal wall.

468. Treatment.—The amount of bleeding in these thrombi is usually limited, for the pressure of the tissues into which bleeding occurs naturally controls it. In noninfected cases the extravasated mass is ultimately absorbed, although in large collections it may remain for quite a long time. A patient recently came under my observation in whom an operation was required for pelvic inflammation. On examination, a mass was felt posterior to the rectum, in the neighborhood of the sacrococcygeal articulation, which had an elastic sensation. Upon inquiry, I found she had undergone her first labor six months before, with a history of an injury to the coccyx. The coccygeal injury had, however, disappeared; the mass remained.

As I had already made an incision through the vagina into the peritoneal cavity, I did not care, therefore, to attempt to open into this from the vagina, on account of the dissection required around the rectum. An incision was made into this sac posterior to the anus, when a teacupful of thick, pasty, reddish material, evidently the remnants of the clot, was evacuated. Gauze drainage was instituted, and the cavity gradually closed. When the collection is small, it may, without detriment to the patient, be left to nature; but when large, the pressure produces thinning of the enveloping wall and permits the ready introduction of infecting germs, either from the rectum or the vagina. In such collections the danger of subsequent infection is decreased by free incision and the evacuation of the accumulation. Not only should the clots be removed, but measures must be employed to preclude further hemorrhage. A large bleeding vessel may be secured by passing a ligature beneath or about it with a needle. When ligation is impracticable, hemorrhage should be controlled by packing with iodoform gauze. The gauze should be retained for two or three days, and should be renewed with a smaller amount, in order to keep the external wound open long enough for the cavity to undergo thorough contraction.

469. Peri-uterine hemorrhage may be intraperitoneal or extraperitoneal. Intraperitoneal hemorrhage, unless preceded by inflammatory adhesions which form limitations, is free, and may be large in quantity. Extraperitoneal hemorrhage takes place into the cellular tissue about the uterus and the broad ligaments, and is limited by the pressure of the tissue. Hemorrhage into the cellular tissue beneath the peritoneum undergoes coagulation and forms a bloody tumor, known as a hematocele. It is analogous to the thrombus which occurs during the progress of labor, and which we have described under the term vulvovaginal.

Hemorrhage into the peritoneal cavity will form a coagulum, and subsequently a tumor, or, when very free, may remain liquid and the hemorrhage continue until the death of the patient or until surgical intervention is practised.

470. Causes.—The causes may be divided into two classes: first, hemorrhage that results from extra-uterine pregnancy, which is more important, because more frequent and more serious in its results; second, hemorrhage of nonpuerperal origin, which occurs without the existence of fecundation. The pelvis being the most dependent portion of the abdomen, hemorrhage from any of the intra-abdominal viscera, or within any portion of the peritoneal cavity, naturally gravitates into the pelvis. Thus, we may have intra-abdominal hemorrhage

from traumatic injuries of the liver or spleen, rupture of an aneurysm of the aorta or of the celiac axis, rupture of varicose veins, from the ovary, regurgitation from the Fallopian tube of menstrual blood (particularly when there is obstruction of the uterine neck), rupture of a uterine or tubal collection, rupture of bands of adhesion in the pelvic peritoneum, slipping of a ligature, or the retraction of a cut vessel following an operation. Any of these causes may lead to an accumulation of blood in the pelvis or, particularly, in Douglas' pouch, whereby the intestines containing gas are floated up and the uterus is pushed forward. Soon or later the coagulated blood causes irritation and leads to the formation of adhesions, by which

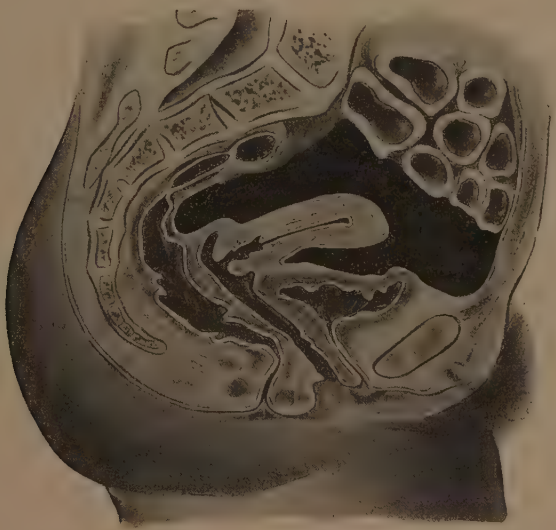


Fig. 421.—Intraperitoneal Hemorrhage.

the collection may become encysted and form what is known as an intraperitoneal hematocele (Fig. 421). The most frequent cause, however, belongs to the division of the puerperal or extra-uterine.

471. Symptoms.—When hemorrhage is due to extra-uterine pregnancy, its occurrence is preceded by disordered menstruation, and the patient will probably give a history of having missed one or more periods. The ordinary symptoms of pregnancy have been present and she has supposed herself pregnant. Pain of a severe, cutting character has been felt upon the affected side, which may have been paroxysmal and quite intense in character. However, it may have occurred with-

out any premonition as a violent attack of tearing, cutting pain, which caused the patient, while standing, to fall and become unconscious. These phenomena may have been followed by repeated attacks of syncope, in which the countenance became pale, anxious, and covered with clammy perspiration, the lips pale and blanched, respiration sighing, the sight obscured, a sensation of blindness being present, the mind frequently wandering, or the patient remains unconscious or passes from one attack of syncope into another. The pulse at the wrist becomes exceedingly feeble, faint or imperceptible, the temperature subnormal, and all the indications of approaching dissolution are present.

According to the intensity of the hemorrhage, the patient may either die in the first attack,—that is, within half an hour or an hour after the first symptoms,—or slightly rally and an apparent recurrence of the hemorrhage follow with death within less than twenty-four hours. Should the patient survive twenty-four hours and rally, her strength may gradually return and recovery follow; or a secondary hemorrhage may occur and terminate fatally. In the early stage of the trouble no physical signs of the existence of hemorrhage can be recognized. Possibly a large quantity of blood exuded into the abdominal cavity of a thin woman could be recognized by the sensation of fluctuation. After twenty-four hours the blood will accumulate in the pelvis, and we can then recognize a sensation of fluctuation and slight resistance by vaginal palpation. Changing the position of such a patient will permit this collection to flow out of the pelvis and its presence be no longer recognized, when by again lowering the pelvis the accumulation returns. The coagulated blood causes more or less irritation, which results in the exudation of plastic material and the occurrence of a localized peritonitis. The abdomen becomes tender to the touch, and a febrile reaction occurs. The temperature, instead of being subnormal, now rises to 101° F., often even to 103° F. The patient may suffer from distress due to the pressure of such a mass upon the rectum or against the uterus and bladder, causing frequent micturition or even incontinence. When the plastic peritonitis occurs, the patient will have nausea and abdominal distention. The peritonitis results in the accumulation becoming encysted in the pelvis and its watery portions partly absorbed. This gives rise to a more constant and resistant mass, which pushes the uterus upward and forward. The intestines are raised above it and a very good idea of the character of the trouble is afforded. The mass varies in its consistency; sometimes it is hard, at others soft, or the same mass may have several

points of softening. The uterus may be enveloped by the tumor, producing what is known as a circumuterine hematocele. The action of the rectum and bladder may be greatly obstructed by compression of the mass against these organs, which occasionally may cause symptoms of intestinal strangulation and retention of urine. Pressure upon the nerves often produces severe neuralgia of the lower extremities. Even should suppuration not occur, irregular attacks of fever are frequently the result of peritoneal reaction. The course of such a disease is essentially chronic or repeated attacks may follow each other. The congestion which takes place at the menstrual periods may result in acute symptoms. Suppurative inflammation in such a mass is ushered in by an aggravation of both the local and general symptoms, by chills, elevation of temperature, and profuse sweats. The tumor increases in size and undergoes softening. The mass may subsequently perforate into the rectum and cause the evacuation of dark, purulent, exceedingly offensive material in the stools, which may also produce more or less irritation of the rectum. These discharges are followed by a cessation or disappearance of the tumor. Perforation into the vagina or bladder may also occur, although it is more rare. Perforation into the abdominal cavity is fortunately very rare. When it occurs, however, a violent attack of general peritonitis follows.

472. Extraperitoneal Hematocele.—Extraperitoneal hemorrhage resulting in the formation of a hematocele may be produced by puerperal or nonpuerperal causes (Fig. 422). The former, associated with ectopic gestation, are the more frequent. The nonpuerperal causes are the rupture into the broad ligament of varicose veins, and injury of an artery or its retraction from the stump when the pedicle is ligated *en masse*.

473. Symptoms.—Extraperitoneal hematocele in the broad ligament is limited in its character, and causes symptoms similar to those which have already been enumerated for the intraperitoneal variety, though in a much slighter degree. The indications of shock and collapse are much less marked, and hemorrhage, from its limitation, is much less serious in its influence. As it occupies the broad ligament, it is usually situated upon one side of the pelvis, and pushes the uterus to the opposite side. This hemorrhage may be situated either in the upper part or in the base of the broad ligament, and may produce different physical signs according to its situation. The hemorrhage, when low in the broad ligament, may dissect forward between the uterus and bladder, or backward around the uterus beneath the peritoneum, and extend to

the opposite side. In the great majority of cases, however, extraperitoneal hemorrhage is one-sided.

474. Diagnosis.—Peri-uterine hemorrhage, whether intraperitoneal or extraperitoneal, is determined by the phenomena of internal hemorrhage. It is true that similar symptoms—a sharp pain, symptoms of collapse—might arise from rupture of a pyosalpinx or a pelvic abscess. In such accidents, however, acute agonizing pain is caused, with symptoms of peritoneal reaction which are more intense than when from the hematocele, but a tumor does not form. A retroflexed gravid uterus may be mistaken for hematocele, but the outline of the boundaries of the organ are more definite than those found in hematocele. In the latter the uterus is frequently inclosed within a mass or pushed forward, while by a careful examination in a retroflexed gravid uterus the cervix is found at a higher level, either in the axis of the vagina or looking forward; a distinct angle exists between it and the smooth, definitely outlined mass filling up the pelvis, which should not be confounded with hematocele. Ovarian cysts and uterine fibroids imprisoned within the pelvis possess nothing in common with hematocele. The manner of appearance and the course of development of the condition are entirely different. Extra-uterine pregnancy before rupture does not present similar symptoms, although it may be a starting-point for the later hemorrhage, and unless the examination is carefully performed, rupture may result from the methods used for diagnosis. Extraperitoneal hemorrhage is determined from intraperitoneal by the situation of the collection upon one side, which is more definitely localized, its boundaries more sharply defined, and the uterus generally pushed to

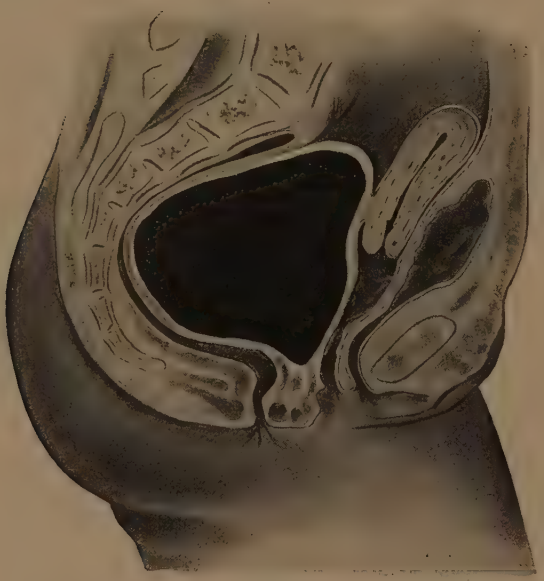


Fig. 422.—Extraperitoneal Hematoma.

the opposite side, while in the intraperitoneal hematocele the latter is surrounded by the accumulation or is pushed forward. The determination of the cause of the hemorrhage is not always easily accomplished. Previous symptoms of pregnancy, amenorrhea, with symptoms rapidly ushered in, profound depression, and very marked anemia, should lead to the suspicion of probable rupture of a fetal sac. Symptoms of collapse, or depression, of internal hemorrhage, may arise from rupture of internal varicose veins. In hemorrhagic salpingitis the condition is more insidious, the progress more slight, owing to the gradual effusion of blood. Should there be any doubt of intraperitoneal hemorrhage, the true condition can be surely determined by making an exploratory puncture through the posterior vaginal fornix. This is a justifiable and commendable procedure.

475. Prognosis.—The affection is always a serious one. We can not be certain that death may not suddenly result from a continuation of the hemorrhage, or, when hemorrhage has apparently been arrested, that the clot may not be loosened and hemorrhage again recur. In large collections the progress of the case is exceedingly tedious. Plastic material remains about the uterus for a long time, becomes more or less organized, is frequently a source of discomfort, and often a cause of sterility. That sterility is not invariably caused is evident from the numerous cases recorded in which women have suffered from hematocele, in whom the collection is ultimately absorbed, and the patient again undergoes an ectopic gestation, and the experience is repeated. The presence of a large collection of blood within the pelvis is a source of continuous danger, from its close proximity to the vagina and rectum, through either of which channels infectious material may enter, to cause pelvic suppuration. Suppuration is particularly likely to occur if the individual has had previous tubal disease, from which, doubtless, the infection develops. The extraperitoneal variety is less serious in its influence, much more likely to undergo absorption, and leaves less evidence of its previous existence. Its situation renders it less susceptible to infective changes. When the collection is large, however, and has existed for some time, the patient will, without question, have a more favorable prognosis by the exercise of measures for its removal.

476. Treatment.—Active interference must depend very much upon the character of the symptoms and the severity of the attack. When the symptoms are such as to indicate extra-uterine pregnancy, with rupture of the sac and escape of a large quantity of blood into the pelvis, the abdomen should be opened promptly, clots removed, and the bleeding vessel secured. In profuse internal hemorrhage ligation of the bleed-

ing vessel is just as certainly indicated as in hemorrhage from the radial or femoral artery. When hemorrhage has apparently been arrested and a reactive peritonitis develops, we are not absolutely certain that the clot can not be displaced and the patient suffer from a recurrence of hemorrhage, which may be fatal, or that the collection of fluid about which nature is forming its barriers may not become infected from the neighboring hollow viscera and cause subsequent changes, necessitating its evacuation, with increased danger to the patient. In extraperitoneal hemorrhage the indications for operation are not so marked. The symptoms are much slighter, the amount of exudation is less, and the probabilities of infection are diminished. In such cases we can afford to wait and trust to nature to absorb the effused fluid. In large collections, however, much time will be saved by its evacuation. The method of operative procedure will depend upon the time the condition comes under observation. In an acute attack, and with an evidently bleeding vessel, we should follow the procedure which affords the most accurate and complete exposure, with the most ready access to the field of hemorrhage. Abdominal incision meets every indication, as through it we are enabled to see and to reach the bleeding vessel. When the patient, however, comes under observation a week or more subsequent to the hemorrhage, when the peritoneal reactive processes have resulted in the blood becoming encysted, and vaginal and abdominal palpation disclose that barriers have been formed by plastic exudate between the knuckles of intestine over the surface of the hematocele, the vaginal incision is the preferable procedure. This procedure is preferable for the reason that it respects the barriers which nature has constructed to limit the collection, and affords a free opportunity for the evacuation of the clots. They are removed by the finger and by irrigation. With gauze packing and a free vaginal incision the subsequent progress of the case is much less severe and the length of the convalescence is decreased. When blood has been effused into the peritoneal cavity, and clots have formed, by neither the abdominal nor the vaginal method would we be able to remove all the clotted blood. The clotted material remains adherent to the sides of the sac and pelvis, and is likely in either procedure to cause a certain elevation of temperature as a result of the fermentation taking place in the retained fibrin. When the condition has gone on to suppuration, there should be no question as to the preferable procedure of reaching the collection, when accessible, through the vagina, rather than by the abdominal route. It should be remembered that not all cases of internal hemorrhage are necessarily fatal nor require opera-

tive procedure. If the patient is unwilling to undergo an operation, or the conditions do not urgently demand it, the promotion of absorption should be accomplished by keeping the patient absolutely at rest in bed, by the use of the catheter to empty the bladder, and by the evacuation of the bowels or intestines by enemata. Absolutely interdict the use of opium, keep the vagina antiseptic by repeated douches, and when it is supposed that hemorrhage still continues, or that it is in danger of being renewed, apply an ice-bag over the abdomen, introduce ice suppositories into the rectum, and thus bring the ice in close contact with the bleeding vessels. In extraperitoneal hemorrhage indications for operation are much less marked. The absorption may be promoted by keeping the bowels regular and the patient at rest, and by the application of cold over the abdomen or of counterirritants. When operative interference seems indicated, the preferable procedure would be to make an incision through the vagina into the broad ligament, tear with the finger or a blunt instrument through the tissue of the ligament until the hematocele is reached, then enlarge the opening, turn out the clots, irrigate the cavity, and introduce gauze to afford vent for further discharge. When the collection is very large, it may sometimes be reached by an incision above Poupart's ligament to the peritoneum. The latter is then pushed off and the collection exposed, opened, and evacuated. After the cavity is thoroughly emptied, it should be packed with gauze, as already advised.

477. Extra-uterine Pregnancy.—By extra-uterine pregnancy or ectopic gestation is understood the development of the ovum outside its normal situation within the uterine cavity. Much difference of opinion exists as to the point at which the union of the spermatozoon and the ovum, and its consequent fecundation, takes place. Tait very firmly asserted that in the normal condition this fecundation always occurred in the uterus. Others as emphatically believe that fecundation may occur at any point between the internal os and the exit of the ovum from the Graafian follicle. The recognition of the fact that in the lower animals the spermatozoa in normal conditions are found in contact with the ovary would seem to afford justification for the belief that fecundation does not absolutely occur within the uterine cavity. Fecundation in the majority of cases undoubtedly occurs in the tube, and the changes which follow, as a result of fecundation, produce alterations in the uterine mucous membrane as a preparation for the reception of the fecundated ovum.

478. Causes.—Much difference of opinion still exists as to the causes which lead to the occurrence of a misplaced ges-

tation. Some would deny that inflammation has any part in its production, and would lead us to believe that the existence of inflammation in the tube always produces alterations which preclude the subsequent occurrence of pregnancy. Every abdominal surgeon of any experience, however, has seen cases in which well-marked tubal disease, and frequently of evident gonorrheal origin, have subsequently recovered, and the patients have given birth to children. During the active inflammation of such tubes the abdominal orifices are closed off by exudate, which, during the following resolution, may be reabsorbed and afford an entrance to the tube. Those who exclude inflammatory conditions as a cause attribute the occurrence of ectopic gestation to congenital conditions. These consist of long tortuous tubes containing numerous tubal constrictions, and, especially, a tubal diverticulum. It is also attributed to intratubular growths, which limit the caliber of the canal, or to growths in the tubal wall, or to pressure of growths external to the tube. The hypothesis of the migration of the ovum from the ovary of one side to the tube of the opposite side has been well established. As evidence, a history is recorded in which an intrauterine pregnancy occurred in a woman who had lost the tube of one side and the ovary of the opposite side. It has been supposed that the ovum, having become fecundated upon its emergence from the Graafian follicle, attains too great a size before it reaches the tube of the opposite side to permit of its passage down that canal. The vegetations upon the ovum, however, which form the chorion, do not develop until the ovum has come in contact with the tubal mucous membrane, hence this cause is of doubtful application. Every one cognizant of poultry is aware that occasionally an unusually large egg will be laid. Indeed, I have seen cases in which the egg was too large to pass through the canal. It is not improbable that similar conditions exist in the formation of the ovum, and that, occasionally, an oversized fecundated ovum may lodge on its way to the uterus. Fright and emotional conditions at the time of conception are ascribed as causes. Were the latter, however, an important factor, we should be likely to find tubal gestation much more frequent in illegitimate cases.

The study of the history of ectopic gestation long ago led to the recognition that a misplaced gestation was frequently associated with prolonged sterility. It is not unreasonable to believe that a period of sterility has been one in which inflammatory conditions have existed and which have subsequently improved. Investigations of inflammatory conditions disclose the fact that loss of the tubal epithelium is of rather rare occurrence. The existence of the gestation is due, not so much to

the presence of patches of desquamated epithelium, as to inflammatory changes which cause the canal to become narrowed, the folds of the mucous membrane thickened, thus rendering the passage of the fecundated ovum more tedious than under normal conditions. The expedition of the ovum to the uterus is also retarded by the decreased peristalsis resulting from hyperplasia and loss of activity in the muscular wall. Gonorrheal inflammation seems to have a special influence in the production of ectopic gestation. Thus, Prochownik found gonorrhea in three out of eight cases, and Ahlfeld, in the few cases he has observed, also attributes the condition to gonorrheal infection. Ectopic gestation may occur at any period of the reproductive life, as in a first pregnancy or in women who have borne a number of children. Analysis of a large number of cases will show that several years of previous sterility will occur in the majority of cases. It may occur in the first pregnancy of a woman who has been married eight, ten, or twenty years, in a woman who has not given birth to a child for five or six years; or, again, it may follow immediately after a labor or abortion. Furthermore, it may occur in the newly-made bride or in the unmarried.

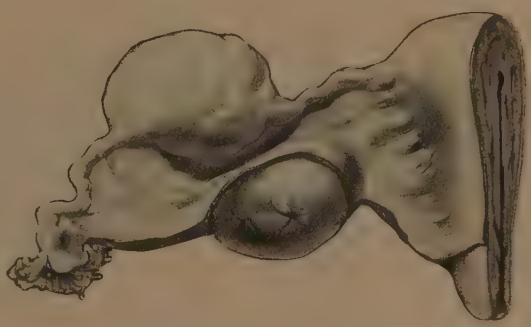


Fig. 423.—Tubal Pregnancy.

Both tubes may be pregnant concurrently or one tube may contain a tubal pregnancy or a tubal may complicate a uterine pregnancy. Cases have been reported in which there occurred a twin pregnancy in the outer portion of the tube, and an interstitial or single pregnancy in the uterine end, making three embryos in the one tube. Dr. Krusen has reported a tubal pregnancy which had ruptured, and in the sac three fetuses were found.

479. Varieties.—Ectopic gestation is most frequently found to be of the tubal variety. Rare cases of ovarian pregnancy have been described, but when we consider the fecundated ovum and the conditions necessary for its nutrition and development, it still remains a question whether the ovum ever develops when not in contact with the Müllerian mucous membrane. It is quite probable that the cases described as ovarian pregnancy have been originally tubo-ovarian and have become

separated from their tubal relation. Tubal gestation occurs most frequently in the central portion of the tube (Fig. 423). It may be situated toward its abdominal end, and as it develops, is extruded or partly extruded and comes in contact with the ovary, when it is known as tubo-ovarian pregnancy (Fig. 424). When situated within the central portion of the tube

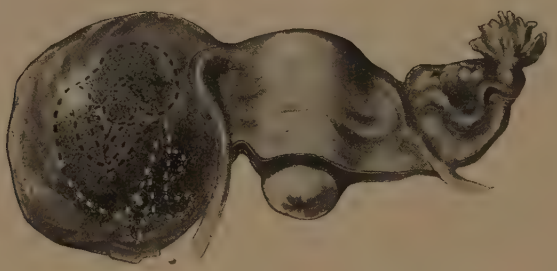


Fig. 424.—Tubo-ovarian Pregnancy.

or ampulla, it is known as ampullar or tubal pregnancy. Toward the uterine end, or that portion which passes through the uterine wall, it is known as tubo-uterine or interstitial pregnancy (Fig. 425). Rupture of a tube with partial escape of the ovum, which retains its placental attachment, may subsequently develop, when it becomes an abdominal pregnancy. Abdominal pregnancy, therefore, is secondary and not primary.

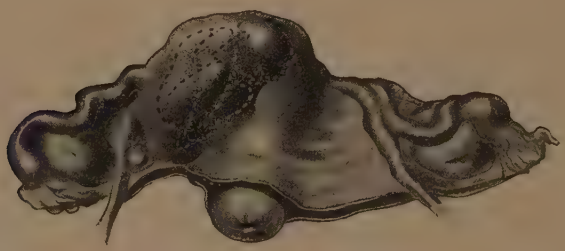


Fig. 425.—Tubo-uterine or Interstitial Pregnancy.

The reimplantation of the ovum upon the peritoneal surface and its subsequent development have been asserted to be an impossibility, but when we find the tube having no longer any relation or connection with the sac, the placenta situated, as in the case of Tuholske, upon the liver, and apparently upon the folds above it, it seems impossible to explain its occurrence upon any other ground than that of reimplantation.

480. Course and Progress.—The fecundated ovum lodged in the tube finds a condition different from that of the ovum within the uterine cavity. In the latter, the mucous membrane consists of glandular or lymphoid tissue, which becomes thickened as a preparation for the reception of the fecundated ovum, in which the trophoblast cells of the ovum enable it to sink in and become embedded. The syncytial cells in the chorion arise from the trophoblast cells, and the uterine epithelium in no sense plays any part in their production. In the tube it meets with an entirely different condition. There are no glands, and there is much difference of opinion as to the formation of the decidua. This, in the uterus, consists of a compact and spongy layer, but in the tube, of a compact layer only. The decidua cells are found not so much in immediate contact with the wall of the tube as at either end of the sac. Bandler, in his investigations on the development of ectopic gestation, divides

Fig. 426.—Tubal Abortion.

it into three types: (1) The columnar type of tubal gestation; (2) the intercolumnar; and (3) the centrifugal. (1) In the columnar variety, at no point in the tube wall or in the mucosa is there any decidual change or any condition representing the trophoblast cells or villi, consequently no decidua or trophospongia develops. The ovum is surrounded by mucous folds and only an invasion of the tubal capillaries follows. Abortion in these cases is easy and causes but little danger; bleeding occurs; the fetus dies, and further hemorrhage expels it. The tube may subsequently become normal or a hematosalpinx may follow (Fig. 426). (2) In the intercolumnar type one-half of the tube is normal, the other torn and infiltrated, the mucous folds are involved down to the muscularis. The ovum is situated upon the tube wall, where it compresses and destroys the folds at the situation known as the serotina. These folds are united at either side about the ovum, forming a pseudo-

reflexa. Some distance on either side of the serotina, tissue, resembling decidua with closely grouped cells without capillaries or spaces, rests upon and invades the free surfaces. The invasion traverses the mucosa in irregular branches or projections about the blood-vessels, invading and infiltrating their muscular walls up to and into the lumen. Trophoblast cells are accompanied by syncytium, but at no point do the connective-tissue cells, the tubal folds, or the delicate submucosa, if present, exhibit any evidence of change which resembles in the slightest degree those occurring in the uterine mucosa, from which the decidual cells develop. Neither is there at any point any change of a so-called syncytial character. The ovum rests upon the wall and the tubal fold immediately beneath it will be compressed, but the epithelium may remain in the depressions. Other folds may form a capsularis, which consists of mucosa alone. An intervillous space may develop when the capsularis is formed. The villi at the placental site enter the wall, and hemorrhage follows, especially upon the invasion of vessels of the capsularis by fetal cells. The pregnancy may terminate in abortion, complete or incomplete, the latter usually being the rule. If the abdominal end is closed, a hematosalpinx or tubal mole may follow. (3) The syncytial type. In this the tissue of the tube is invaded by villi cell groups—syncytial cells. Here again there is no evidence of a decidua or of any decidual reaction. When uninterrupted, the capsularis unites with the mucosa of the enveloping tube wall in the same way that this process is exemplified in the uterus. The centrifugal ovum sinks into the wall of the tube, when invasion of the wall and vessels by the villi occurs. Rupture may take place at the summit or hemorrhage from invasion of the vessels entering into the intervillous spaces. Bleeding from the villi penetrates the serosa and rupture at the placental site may follow, or we may have multiple perforation and erosions. The ovum apparently eats up the tube wall and its destruction is not the result of pressure. In such cases the perforations may be so minute as only to be revealed by a microscope. The death of the ovum may not arrest the growth of the villi. This form furnishes the majority of cases of rupture. Very frequently the hemorrhage is due not to rupture, but to the erosions from the perforating villi. The presence within the tube of the developing ovum causes the entire structure to become turgid and vascular. There is some tendency in the tube to the development and extension of its structure, but to a much less degree than in the uterus. The wall becomes stretched, attenuated, and thin. The mucous membrane is stretched and its folds effaced. As the tubes vary in length

and thickness, the rapidity of thinning correspondingly differs. When the ovum is situated in the outer third, changes follow in the ostium. In the first four cases the fimbria are swollen, turgid, and the congestion extends to the adjacent muscular and serous tissue; the fimbria are gradually retracted, while the peritoneal margin of the ostium forms an irregular ring, which in four and one-half weeks projects beyond the ends of the fimbria. It finally contracts, and at the end of the eighth week is completely contracted and hermetically sealed. The occlusion, however, is not constant. Occasionally the ostium dilates. The nearer the ovum is situated to the abdominal end, the less likely will it become closed. As the tube distends, its vessels rupture and hemorrhage takes place, which fills up the sac and may cause the extrusion of the ovum. The more firmly the tubal end becomes occluded, the greater the danger of tubal rupture. Its situation near the abdominal ostium favors its extrusion through the opening into the abdomen as a tubal abortion. Moles occur in tubal as in uterine gestation; indeed, they are more frequent in the former. They vary from one to eight centimeters in diameter and are globular or ovoid, assuming the latter shape in the larger varieties. The tubal moles are formed by hemorrhage, which occurs in the subchorionic diameter, between the chorion and the amnion. This hemorrhage may be gradual or sudden, and results in the death and often in the disappearance of the embryo. The puerperal origin of the condition in the absence of any vestige of the fetus is recognized by the discovery, with the microscope, of the chorionic villi. The outer investing membrane, the chorion, is generally shaggy, with villi, which are rendered more visible by washing the clot under a gentle stream of water. When the amniotic cavity is obliterated, doubt may exist as to the character of the mass, but section will disclose the villi in clusters as small circular bodies. Tubal abortion has been mentioned as one of the terminations of tubal gestation, when the developing embryo occupies the external third of the tube. The nearer the fecundated ovum is situated to the ostium, the greater the danger of its extrusion. As the embryonal sac increases to a size beyond that which the tube is able to accommodate, it is pushed out through the funnel-shaped cavity and escapes into the abdomen. This accident is denominated tubal abortion, and is frequently associated with profuse hemorrhage, which is very similar to that which occurs in uterine abortion. The mole is discharged with copious hemorrhage into the peritoneal cavity. This displacement is likely to take place during the first two months of the pregnancy. When the ostium is closed, blood escapes from the tube

only after rupture of the sac. The quantity of blood discharged is sometimes enormous and attended with all the symptoms of internal hemorrhage. This condition is one of the most frequent causes of pelvic hematocele. Internal hemorrhage in such cases has been ascribed to metrorrhagia, to reflex menstrual discharge from the uterus, or to hemorrhage from the Fallopian tube. The reason why it has been associated with metrorrhagia is that while the embryo is developing in the tube a decidua is forming in the uterus. With a tubal abortion, hemorrhage occurs from the uterus as a result of the separation and the expulsion of this decidua. This not infrequently happens near the time the patient expects to menstruate, and is, consequently, regarded as reflex menstrual fluid. Very frequently the bloody discharge from the uterus may be derived from a gravid tube in protracted tubal abortion. If the bleeding occurs at a time not synchronous with the menstual flow, it is often attributed to a disorder of the uterus. In all such cases the affected tube and the bloody discharge should be carefully examined for the presence of the embryo or the chorionic villi. The abortion may be complete or incomplete—complete when the embryo and its envelope are discharged; incomplete when a portion remains attached to the tube. The latter is the more common. The danger is increased in these cases, owing to the fact that the bleeding is apt to recur while the mole is retained. The villi will be disclosed by careful microscopic examination of the extruded mass and are discovered in sections of the adherent pole of the mass.

A third termination of tubal gestation is that of rupture. As the embryo develops, the tube becomes more and more thinned, until it is no longer able to resist the inward pressure, and rupture results. Rupture of the gestation sac may be considered under: first, primary rupture; second, secondary rupture—each of which may be intraperitoneal or extraperitoneal. Primary rupture takes place at any time between the third and tenth weeks after impregnation, and is rarely deferred beyond the twelfth. Predisposing causes of rupture are the gradual thinning of the gestation sac by the growth of the ovum or the undue distention of the membrane by hemorrhage, especially at the seat of implantation of the chorionic villi. The perforation of the tubal wall by the villi may be excited by violence, as jumping from a train, straining at stool, jarring of a carriage, vomiting, or sexual congress. Rupture may occur as a result of efforts to determine the diagnosis.

It was my misfortune to see a case of this kind in which the examination by myself, and subsequently by the attending

physician, was followed within a few minutes by symptoms of profound collapse, which confirmed the suspicion that an extra-uterine pregnancy was present. As soon as permission could be secured the abdomen was opened, to find half a gallon of liquid blood within it; and although the vessel was secured, and every measure taken to restore the patient, she succumbed to the shock.

The tube is enveloped in two-thirds of its circumference by the peritoneum, which forms a mesosalpinx; as the tube is enlarged by the developing embryo the mesosalpinx separates. This condition is true only of the internal two-thirds of the tube. The external third is not supplied with the mesosalpinx. The intraperitoneal rupture is three times as frequent as the extraperitoneal. In primary intraperitoneal rupture the embryo and its enveloping membranes, or a mole, are discharged into the abdominal cavity, and a certain amount of hemorrhage follows. The amount of blood extravasation will depend upon the period of pregnancy when the rupture occurs; when early, it may be slight. After the first month, however, it is copious, frequently sufficient to cause death in a few hours. I saw one patient who had missed her period but five days. She was taken with violent pain at night, fainted several times, and was seen and subjected to operation the following morning. She was then extremely anemic, and the abdomen was found filled with a large quantity of blood, which had escaped from a cyst not larger than a bean in the left Fallopian tube. The ligation of the bleeding vessel and the removal of the extravasated blood resulted in her restoration to health. Frequently the hemorrhage may be so great as to cause a fatal result in a few hours; in some cases even in half an hour. When a rupture is deferred until the seventh week, the embryo or mole is not constantly discharged through the opening. The quantity of blood which escapes may be very large, and demand immediate attention, or it may be slight in character, permitting the patient to escape the immediate dangers incident to the accident with but slight shock. The effused blood can undergo absorption and recovery ensue. When the discharge is not excessive, the blood collects in the rectovaginal fossa and floats the coils of intestine, forming an intraperitoneal hematocele, as has been described. Dangers of the primary intraperitoneal rupture are: first, hemorrhage so great as to cause immediate death; second, the fatal result may be occasioned by repeated hemorrhage. In primary extraperitoneal rupture that portion of the tube not covered by peritoneum gives way and permits the discharge of the ovum and the accompanying blood between the layers of the

mesosalpinx. Here the blood is forced into the connective tissue between the layers of the broad ligament, and, fortunately for the patient, the bleeding is checked by the pressure from the resisting tissues, and is generally arrested before it assumes dangerous proportions. This lesion rarely causes trouble. Occasionally, the rupture of the tube is slight, the embryo partly escapes, with its membranes remaining uninjured, and the pregnancy will continue. Rupture affords increased space for further development, and, the power of resistance being decreased, the ovum, as it increases in size, burrows between the layers of the broad ligament. The rupture may be gradual; the tube does not split suddenly, but as its walls, through the gradual distention, become thinned, they yield in the part uncovered by peritoneum until an opening forms and the ovum is extruded, accompanied by sudden hemorrhage. The extent of collapse and its duration will be largely dependent upon the amount of blood effused. The artificial opening gradually extends, the embryo and placenta make their way into the new area, and, unless the hemorrhage be sufficient to terminate the life of the embryo, the pregnancy is continued. This is known as a mesometric or an intraligamentary gestation. In this anomalous development of the ovum the placenta is liable to many changes which will vitally influence the life of fetus and mother. The tubal mucous membrane, as has been mentioned, plays a very insignificant part in the formation of the placenta. The latter is developed mainly from the fetal tissues, as the tube does not develop a decidua. With the fecundation of the ovum there are at once developed changes in the uterine mucosa in preparation for its retention and sustenance. When the fecundated ovum is arrested in its progress, and prevented from entering the uterus, the uterine decidua continues to develop as if it were normally placed. This decidua, however, is rarely retained until the completion of gestation, but is thrown off during the false labor; not infrequently, when the individual suffers from symptoms of tubal abortion or tubal rupture. The occurrence of this profuse bleeding after one or two months' amenorrhea, with the discharge of a cast or of shreds of tissue from the uterus, which may frequently be enveloped in a large clot, lead the patient and her attendant to believe that a uterine abortion has occurred. When the individual goes to term, the uterine decidua is thrown off as a cast or in shreds, during the early months of the pregnancy. When the decidua is discharged in small fragments, it takes place without unusual pain; but *en masse*, the symptoms are similar to those of a miscarriage. The absence of the uterine decidua at the death

of the ovum from rupture of the cyst, even in the early stages of pregnancy, is no proof that the membrane has not existed and been expelled before fetal death. When pregnancy occurs in one-half of a bicornate uterus, the decidua is present in the unimpregnated cornu. Under no circumstances, however, either in the normal or abnormal pregnancy, is a decidua found in the Fallopian tubes. As the destructive changes of the mucous membrane of the genital tract associated with menstruation are limited to the uterine cavity, so the true decidua is found in the same portion. It is sometimes important to avoid confounding the decidua of pregnancy with the cast thrown off from the uterus in membranous dysmenorrhea. In the former, it consists of a compact layer of decidual cells. In the latter, the cast is more likely to involve a portion of the glandular structure of the uterus.

Rupture may be complete or incomplete. Complete rupture is one in which the ovum and its envelopes escape, either into the peritoneal cavity or into the broad ligament, with more or less profuse hemorrhage. (Fig. 427.) A partial rupture may result in the gradual thinning of the wall until it gives way in one place; and when this takes place extraperitoneally, it is reinforced by plastic exudate, with the occurrence of but little, if any, hemorrhage. (Fig. 428.) Successive ruptures or partial ruptures thus occur until finally the envelope becomes sufficiently distended to permit the fetus to develop as in an intra-abdominal pregnancy. At no time during such a rupture has the separation occurred between the placenta and the tube. In the extraperitoneal variety the embryo and placenta gradually occupy a sac formed by the expanded tube and separated layers of the broad ligament. The floor of this space is formed by connective tissue and the levator ani muscle. The ultimate effects depend to a great extent upon the original situation of the placenta. When the embryo

Fig. 427.—Complete Rupture of a Tubal Sac.

is situated above the placenta, the latter is depressed between the layers of the broad ligament until it is arrested by the pelvic floor. If the embryo lies below, and the membranes burrow between the layers of the broad ligament, the placenta is pushed up until it lies high in the abdomen. As there is no tubal decidua the placental villi lie embedded in the decidual cells without any intervillous system existing. When the placenta is displaced into the tissue of the broad ligament, which occurs gradually, its structure becomes seriously damaged: the villi are less perfect in their contour, points of extravasation of blood are present, and blood-crystals are abundant. Finally, under the pressure, the placenta becomes gradually reduced to a mass of compressed villi; its serotina is destroyed and is replaced by blood-crystals and by organized blood-clot. While the consequences to the placenta from its displacement into the tissue of the broad ligament are thus marked, it is not attended with nearly so much danger as when the placenta is situated above the embryo. It is then subject to extreme disorganization, forming, as it does, the roof of the gestation sac. The changes that take place in the placenta owing to the pressure of the developing fetus have a great influence on the subsequent history of the pregnancy, adding to a marked degree to the peril to the life of the mother, and are, in the majority of cases, disastrous to the life of the fetus. The constant tension to which the peritoneum covering the gestation sac is subjected leads to partial detachment of the placenta and to severe hemorrhage, either into the gestation sac or into the peritoneal cavity. In the later stages of the pregnancy such hemorrhage is almost invariably fatal. A woman with an intraligamentary pregnancy, with a placenta situated above the fetus, runs a greater risk of losing her life than she would from placenta prævia. A tubal placenta which is situated above the embryo has its structure so damaged by rupture as to render it an inefficient respiratory organ; and the constant results upon the embryo are very marked. The fetus from such a gestation is rarely a satisfactory individual. It is very unusual for the

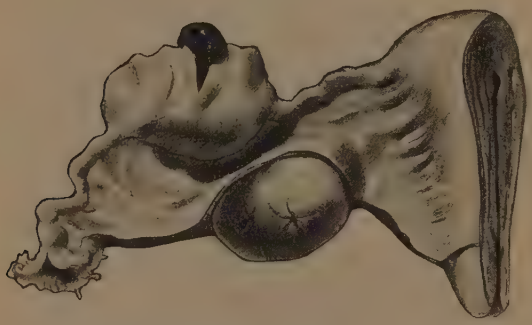


Fig. 428.—Incomplete Rupture of Gestation Sac.

fetus to live longer than a few days or weeks subsequent to its delivery. Not infrequently it is ill formed, suffering with hydrocephalus, club-foot, spina bifida, ectopia of the viscera, and other deformities. When normal in shape, it is exceedingly defective in size. One case is recorded in which the tubal sac contained two embryos, measuring eleven centimeters in length, which were united by a band in the thoracic region. Dr. M. Price reports a well-formed ectopic fetus which survived operation and was subsequently healthy. The amount of hemorrhage in an incomplete rupture will depend much upon the situation of the placenta. If the placenta be attached to the peritoneal surface and rupture takes place over it, the bleeding will be excessive and will possibly result in the death of the patient, unless surgical intervention prevent. If the placenta is situated on the opposite side to that on which rupture occurs, the envelopes may protrude, but little bleeding will follow, and the sac becomes reinforced by plastic exudate and adhesions. The sac wall is then formed by the uterus, the bladder, the parietal or pelvic peritoneum, and the coils of intestine.

Secondary Rupture.—The extraperitoneal rupture causes the formation of a secondary broad ligament gestation sac, which increases in size and may subsequently undergo rupture. As has already been indicated, the danger is much increased when the placenta is situated above the fetus. As the pregnancy progresses the peritoneum becomes stretched and is separated from the adjacent parts and from the viscera. The sac extends into the abdomen, and strips the peritoneum from the anterior abdominal wall to a greater degree than would an overdistended bladder. When the posterior peritoneum is thus raised up, the rectum, as well as the posterior surface of the uterus, may be deprived of serous investment. The placenta is insinuated between these parts, and secondary rupture may result at any time between the twelfth week and the completion of term. The effects of this secondary rupture are dependent upon the injury to which the placenta is subjected. After the middle period of pregnancy has passed, when it involves the placenta,—as it almost certainly will, situated, as the latter is, above the fetus,—most frightful hemorrhage and rapid death is the consequence. Earlier in the course of the pregnancy the hemorrhage is not so severe, and may be arrested by prompt surgical intervention. Opening of the sac into the peritoneal cavity is recognized as secondary intraperitoneal rupture. If the fetus occupies the upper portion of the sac and the placenta is attached below, the former may escape among the intestines. Secondary rupture does

not always occur. The patient may go to term, spurious labor follow, the liquor amnii be absorbed, and the placenta disappear. If the extra-uterine pregnancy has not been suspected and its course not disturbed, the formation of a mummified fetus, or lithopedion, results, which may be discovered years later. Secondary intraperitoneal rupture may occur at any time between the twelfth week and term. When it occurs at or near term, the belief is perpetuated that the fertilized ovum had tumbled into the peritoneal cavity, to ingraft itself upon the serous membrane and there develop. It should be understood, however, that there is no primary peritoneal pregnancy but that the condition originally developed in the Fallopian tube. When the pregnancy develops in the uterine end of the tube, particularly that portion which traverses the uterine wall, it is termed a tubo-uterine pregnancy. This form of pregnancy is not frequent, and can readily be confounded with pregnancy in one cornu of a bicornate uterus. The tubo-uterine gestation differs in its course, relations, and mode of termination from the purely tubal form. Primary rupture generally occurs before the eighth week, and the pregnancy is rarely continued without rupture beyond the twelfth week. The tubo-uterine gestation sac may rupture in two directions: into the peritoneal cavity, causing frightful hemorrhage and a rapidly fatal result, or, resistance being slighter toward the uterine cavity, the fetus and envelopes may be pushed into the uterus and terminate as in an intrauterine conception. The intraperitoneal rupture is much more rapidly fatal than in the tubal form, and causes more severe hemorrhage, because the uterine wall is more vascular and the sac is situated in closer apposition to larger vessels. Tubal and tubo-uterine pregnancy have the following distinctive characteristics: the tubal pregnancy is very common, the tubo-uterine rare; the tubal gestation sac is very thin, the tubo-uterine very thick.

The termination can be: (*a*) Intraperitoneal rupture for each, or (*b*) rupture into the intraligamentary space. In the tubo-uterine, rupture can occur into the uterine cavity, with the discharge of the fetus through the vagina. (*c*) In the tubal, abortion can result, and, as in the primary rupture, date from the third to the twelfth week. In the tubo-uterine, rupture occurs at any time from the fifth to the twentieth week. Ovarian pregnancy, pure and simple, is extremely rare, and while there are cases in which careful examination has disclosed ovarian structure in the sac wall, with the tube free and unaffected, yet we are not prepared to admit that the condition may not have originated from the tube, for it is very doubtful whether the ovum will develop when not attached to the Müllerian

structure. The majority of cases of ovarian pregnancy are undoubtedly tubo-ovarian, in which the embryo was originally situated in the orifice of the tube and has been partly extruded without loss of its vitality. As would be readily inferred, the life of the embryo in a tubal pregnancy is necessarily precarious. After rupture, undoubtedly the pregnancy may continue until full term. Symptoms of labor set in, during which the gestation sac may burst into the peritoneal cavity, or, if this catastrophe is avoided, the fetus dies. The body remains quiescent or produces various forms of disturbance. Thus, the liquor amnii is absorbed; the tissues of the fetus become mummified or partly calcified, and form a lithopedion. The softer parts are converted into adipocere or undergo other forms of decomposition. The placental tissue is gradually absorbed and disappears.

Mummification.—The process of mummification is attended with absorption of the fluids, while the soft parts are converted into a dried tissue similar to that which follows when a dead cat is permitted to remain under an old building, producing a dried cat. An extra-uterine fetus can be retained in the body for a longer period of time. Cheston reports a lithopedion carried for fifty-two years; Barnes, one forty-two. The possibility of the fetus being carried this length of time does not necessarily indicate that it can not prove a source of danger to the patient. Pathogenic micro-organisms can find entrance to the sac through the adjacent hollow viscera, and at any time produce serious trouble. Suppuration follows, and pus finds its way through the sac-wall, and penetrates the vagina, uterus, bladder, or rectum. Through any of these openings fragments of fetal tissue from time to time escape, causing frightful distress and necessitating operation for relief. The existence of a lithopedion or macerated fetal skeleton does not preclude subsequent pregnancy. One case came under my observation in which a woman with a good-sized and distinctly well-defined lithopedion subsequently gave birth to two children.

481. Symptoms.—The symptoms of an ectopic gestation are dependent upon the duration and course of the pregnancy. Prior to rupture the symptoms are those of an ordinary pregnancy, excepting a sense of uneasiness in the affected side, with frequent and sudden attacks of colicky pains. In many patients the first indication of the pregnancy being abnormal will be an attack of pain so severe and lancinating in character as to cause the patient to lose consciousness. In severe cases the patient falls back unconscious, and is covered at once with a cold, clammy perspiration; presents symptoms of most pro-

found anemia and a sighing or gasping respiration; when conscious, complains of intense pain in the lower abdomen and pelvis; has a frequent, feeble, scarcely perceptible pulse and dilated pupils; complains of loss of sight—of everything being dark about her; attacks of syncope recur; and, unless the condition is promptly recognized and intervention practised, death follows. Occasionally, the symptoms are not so marked; the patient is weak, debilitated, shows symptoms of shock or collapse, soon rallies, with recurring attacks of a similar character, which indicate that the hemorrhage has again recurred. In other cases the progress of the case is insidious; a small aperture has occurred, the walls have been stretched, and the pregnancy may progress without further accident. The tube may have ruptured intraperitoneally or extraperitoneally. The symptoms of the two varieties are entirely different, and the gravity of the symptoms of the intraperitoneal variety will depend upon whether the rupture has been complete or incomplete, and also upon the situation of the placenta. When the rupture occurs over the placenta, even though incomplete, hemorrhage can be so severe as to cause the death of the patient if intervention is not instituted. If the patient survives the hemorrhage and shock, the accident is followed by more or less tenderness over the abdomen and by abdominal distention, which are indications of localized peritonitis. The sac becomes encysted, and intraperitoneal hematocele follows. In the extraperitoneal variety the symptoms are not nearly so marked; the indications of collapse are slighter, the patient rallies more quickly, and the resistance of the tissues limits the amount of bleeding. The distressing symptoms are often so slight as scarcely to lead the patient to apply for examination; and when examination is made, it is more likely to be with the purpose of determining the existence of pregnancy than the occurrence of an abnormal location for the embryo. With the occurrence of symptoms of rupture there is not infrequently a discharge of blood from the vagina, which is generally associated with uterine pain. The uterine pain or the pain arising from rupture may cause the individual to believe that an abortion is about to occur. This suspicion is still further confirmed by the discharge of a cast of the uterus or of shreds of tissue associated with clots, which may deceive both the patient and her attendant into the belief that an abortion has occurred. When the hemorrhage is slight and the ovum retains its connection with the tube, the fetus may go on to full development, and may reach full term. The pregnancy, especially when it is situated posterior to the uterus, may reach full term without leading the patient to the suspicion that an abnormal

condition exists, and it is only after the beginning of labor, when an examination is made, that the true state of affairs is recognized. Even then it is not always recognized, and the spurious labor may terminate without the discharge of the fetus and the sac may undergo subsequent changes.

482. Diagnosis. — Diagnosis comprises: (1) The recognition of extrauterine pregnancy prior to rupture; (2) the determination of rupture or abortion with intraperitoneal or extraperitoneal hemorrhage and death of the fetus; (3) secondary rupture; (4) continued growth of the embryo after rupture; (5) peritonitis; (6) suppuration.

1. Most frequently the victim of misplaced conception does not apply to her physician until the occurrence of a violent, tearing pain, associated with rupture. The distressing symptoms are rarely sufficient prior to this occurrence to demand a physical examination. Such an examination is generally requested in order to ascertain the existence of the supposed normal pregnancy. The frequent occurrence of ectopic gestation, however, should lead to the careful investigation of every patient who gives symptoms of being pregnant, where there is a previous history of more or less extended sterility, of attacks of pelvic inflammation, and, especially, if the latter has originated from gonorrheal infection. Such an examination is particularly indicated when the patient, having missed a period, complains of a sensation of uneasiness or distress in one side of the abdomen, associated with frequent and sudden attacks of colicky pain. Every such patient should be subjected to a careful examination. Slight enlargement of the uterus, with some tenderness in the pelvis, more marked upon one side, associated with a more or less spherical or rounded distention of the tube, should increase the suspicion of ectopic gestation. This suspicion would be confirmed by finding increased vascularity in the broad ligament, causing marked pulsation of its vessels. This pulsation is distinctly recognizable upon the affected side, while the pulsation on the opposite side is not defined. The examination should be made with the utmost gentleness, for rough manipulation or marked pressure in the practice of the bimanual procedure can very readily rupture a sac which is so thin as only to require a slight amount of additional pressure. Where the sac is of considerable size, it is unwise to subject it to much force in the examination, unless the operator is prepared for immediate operation should rupture occur. It has been my unfortunate experience with a patient in whom the pulsation was as distinct as if the finger were placed over the radial artery, to have the sac ruptured by her physician, who was desirous of examining the case.

The patient succumbed to the subsequent operation. Dr. J. M. Fisher, my assistant, reports two cases in which he has observed the rupture of an ectopic gestation during examination.

2. *Rupture.*—The rupture of an ectopic gestation sac may be suspected when the patient gives a history of having failed to menstruate for one or two periods and has exhibited the ordinary symptoms of pregnancy. She has probably had more or less discomfort upon one side, with frequent colicky attacks, when suddenly, without warning, there has been an attack of most violent, tearing pain, followed by syncope, all the symptoms of internal hemorrhage, with oncoming collapse. I have seen such a patient in the space of ten minutes pass from a condition of apparent good health to one which seemed to threaten approaching dissolution. The face was blanched, pale, exceedingly anxious looking, covered with cold, clammy perspiration; pupils dilated, eyes expressionless, rolling from side to side; sighing respiration; pulse rapid, feeble, sometimes almost imperceptible; patient complaining of being unable to see, and everything appearing dark about her. Sometimes marked nausea and vomiting are present. The slightest movement, even raising the head of the patient, is followed by more or less profound syncope. The occurrence of such a train of symptoms should awaken in the mind of the observer the absolute conviction that an internal hemorrhage is occurring, and the association of such a group of symptoms would indicate its origin from an ectopic gestation. A physical examination affords very little information, for at this time the tumor is insufficiently large and without the necessary firmness to afford the sensation of resistance. The physical signs are consequently indefinite. When the bleeding is extensive, the abdominal walls thinned and not very resistant, a sensation of distention may be noted and even fluctuation recognized. When the hemorrhage is not so profound as to endanger life, the watery portions of the effused blood are gradually absorbed and leave a more or less resistant clot, which can be felt as a firm mass in the pelvis. In the absence of previous history of recent inflammatory trouble, or the previous existence of a growth, it must be recognized as effused or clotted blood. The accumulation is generally retro-uterine. A large extravasation may fill the pelvis, push the uterus forward, and raise the intestines above it (Fig. 429). In other cases the uterus may be found in a state of retroversion, while a mass is situated in front and forms an ante-uterine hematocele; or in very large accumulations the uterus may protrude through it, producing what is known as a circumuterine hematocele. Hemorrhage dangerous to life, and productive of the

most profound anemia, may arise without rupture, as in tubal abortion, or when the villi have penetrated the wall of the tubal sac and bleeding occurs from their surfaces. These perforations may be so minute as to be unrecognizable by the naked eye, except for a thrombus projecting from the external tubal surface. The tubal abortion in its earliest stage causes no marked physical manifestations outside of those symptoms which indicate an internal hemorrhage. Later, however, the blood-clots in the tube, filling up the sac, produce a large sausage-shaped mass, which may be firm and resistant. The patients in whom rupture has occurred may present successive attacks of shock and syncope. Thus, a patient bleeds until the blood pressure is greatly reduced, a clot forms, plugs the vessel temporarily, and the circulation is restored. If, however, injudicious

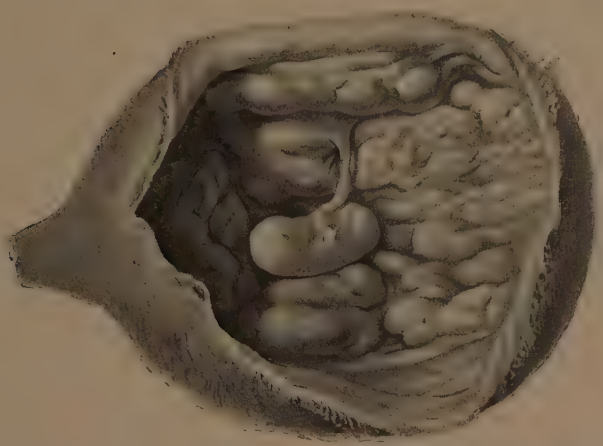


Fig. 429.—Ectopic Gestation Sac Ruptured, showing Fetus.

efforts are made to revive the patient by hypodermic injections of strychnin, digitalin, or intravenous injection of salt solution, the clot is washed or driven out and hemorrhage again recurs with a repetition of the former symptoms. Noble has reported cases in which the rupture and hemorrhage have been associated with a rather rapid and marked rise of temperature. The general rule, however, is that where hemorrhage is marked the patient shows a subnormal temperature, as would be expected in cases of shock and threatened collapse. The temperature rarely is elevated until some days after the hemorrhage, and then is not high. The elevation of temperature is undoubtedly due to degenerative changes in the collection, possibly from the fibrin ferment, or more likely from partial

infection by organisms from the intestinal canal. At the time of this elevation of temperature the peritoneal exudate is thrown out, which forms barriers and confines the blood accumulation within the pelvis. The watery portions of the blood become absorbed, so that we have a more or less distinct and well-defined mass of clotted blood. In extraperitoneal hemorrhage the symptoms are much less acute. Shock or collapse is less marked, although we still have symptoms which, to a limited degree, should lead one to suspect internal hemorrhage. In such a case examination will disclose on one side of the pelvis a mass which may fill up and distend the broad ligament. The tumor may be quite tense and push the uterus to the opposite side. The condition differs from tubal disease in that the broad ligament is distended by it. There has been an absence of recent inflammatory trouble, and the patient does not present the characteristic symptoms of inflammation. In the intraperitoneal variety the irritation of the accumulated blood causes certain reactive symptoms and sometimes the development of peritonitis. The temperature becomes elevated, pulse rapid, the abdomen tender and sensitive to pressure. But the symptoms are not so acute and severe as in marked inflammation. The rupture and internal hemorrhage are usually associated with a discharge from the uterus of decidual membrane, either as a complete cast of the cavity or in the form of shreds mixed with clots. The cast may show the orifice of the Fallopian tubes and internal os. Inquiry should be made with regard to this symptom, and, when possible, the discharged material should be carefully examined. It is important to differentiate it from the decidua thrown off in some forms of dysmenorrhea. That of pregnancy is from six to eight millimeters in thickness, while that of menstruation rarely exceeds two or three centimeters in length and is scarcely two millimeters in thickness, is translucent, is rarely passed entire, and consists of the compact layer of the epithelium. When the symptoms have been slight and the woman has considered herself the subject of an abortion, it is not until the enlarged fetal sac causes a suspicion of the continuation of the pregnancy that the patient will present herself for examination, and even then she may not consult a physician.

3. *Secondary Rupture.*—Secondary rupture necessarily follows a primary rupture, which, in the majority of cases, has taken place in the broad ligament. The rupture has occurred in such a way as not to interfere with the vitality of the ovum. Retaining its vitality, it enlarges its implantation, and in its growth spreads out the broad ligament until the latter is no longer able to retain it, when from pressure the thinned wall

finally ruptures and severe hemorrhage takes place into the peritoneal cavity. The history of repeated attacks of pain and distress, of symptoms of internal hemorrhage, of the enlarging abdomen, and, finally, the cutting, agonizing pain associated with rupture into the peritoneal cavity, should be sufficient data upon which to base the diagnosis of secondary rupture. Both in primary and secondary rupture the amount of hemorrhage will depend upon its relation to the site of the placenta. Where the rupture takes place over the latter, the hemorrhage may be very profound and so rapid as to result in death of the woman before measures can be instituted for her relief.

4. *Continued Growth of the Embryo after Rupture.*—As has already been seen, this growth may take place into the broad ligament, spreading it out, or in those cases in which the embryo has become reimplanted upon the surface of the peritoneum, the ovary, or in a continuation of the tube, we may have the growth advancing as we would in ordinary pregnancy. The fetal movements are recognized, the enlargement continues, and the patient imagines herself normally pregnant. On physical examination of such a patient, the parts are more distinctly defined by bimanual palpation than if the mass were situated within the uterus, as there is less structure intervening between the fetus and the palpating hand. The recognition of the fetal heart sounds is an absolute indication of the existence of pregnancy. With the completion of the normal term of pregnancy in such a patient, we have the occurrence of spurious labor, cessation of fetal movements, and changes occur which, coming under observation months later, may increase the obscurity of the condition.

A patient came under my observation who supposed herself pregnant, and who suffered from a bloody discharge, with considerable pain, at the end of the second month, which led her to think that an abortion had occurred. The supposed abortion occurred in February. Her abdomen consequently became enlarged, and in the following October she went into labor. Pains continued for two days, and after the movements ceased her menstrual periods returned. In April, when she came under my observation, she presented a tumor as large as in a pregnancy at full term, over which there was distinct fluctuation and marked resonance. A thin-walled sac was recognized, but there was no sign of a resistant mass. Vaginal examination disclosed behind the uterus a tumor which filled Douglas' pouch. The uterus was enlarged and was situated directly in front of the tumor. On percussion, there was resonance everywhere. No dullness could be distinguished,

although fluctuation was distinct. The diagnosis was an ectopic gestation, with death of the fetus, decomposition in the fetal sac, and the formation of gas. This diagnosis was confirmed by opening the abdomen and finding posterior to the uterus a sac which contained a macerated fetus and a considerable quantity of offensive fluid.

5. *Peritonitis.*—Peritonitis may take place as a result of rupture of the sac, the escape of its contents into the peritoneal cavity, the accumulation of blood from a large hemorrhage, and its irritation upon the pelvic peritoneum. Unless relief is afforded, extensive matting together of the intestines and pelvic structures occurs, which will require early operative interference for relief. Peritonitis may be produced, also, by the death of the fetus and infection of the sac. Its occurrence is indicated by pain and tenderness over the abdomen, the distention of the belly, assumption of the dorsal position, distress during the evacuation of the bladder or movement of the bowels.

6. *Suppuration.*—Suppuration in an ectopic gestation may follow its rupture, so that the contents of such a sac becomes sanguino-purulent. Suppuration also takes place in later stages of a pregnancy which has gone on to full term; the fetus has subsequently become macerated, mummified, or even a lithopedion has formed. Suppuration may take place months or even years after the occurrence of a pregnancy, leading to the evacuation of the sac or to its rupture into the intestine, the bladder, the vagina, or through the abdominal wall. In such a case the fragments of the fetus and its bony structure will be discharged. Suppuration will be indicated by increased pain and distress, by recurring chills, sweating, elevation of temperature, and the ordinary symptoms associated with suppurative processes. That the suppuration has originated in an ectopic gestation will be demonstrated by the previous history of the case. This is made absolutely certain when the bony fragments of the fetus are discharged.

483. Differential Diagnosis.—Tubal and uterine pregnancy may coexist. Uterine pregnancy may follow tubal, or repeated uterine pregnancies may occur subsequent to the formation of a lithopedion. Tubal pregnancy may be bilateral. Its frequent occurrence in the remaining tube after removal of a tubal gestation sac has led some operators to advocate the removal of both appendages in every case of tubal gestation. Tubal pregnancy may coexist with ovarian and tubo-ovarian tumors. In a case I saw with Dr. J. M. Fisher the symptoms justified his diagnosis of rupture of a tubal gestation sac. From its outline a mass upon the left side of the

pelvis was considered to be a large extraperitoneal hematocele, which I decided to evacuate by a vaginal incision. A large quantity of clotted blood was evacuated, above which was a smooth cyst, too large to remove through the vagina. The ruptured tubal gestation sac was upon the opposite side. The removal of the cyst was effected by an abdominal incision.

The following conditions may be confounded with ectopic gestation: first, uterine pregnancy; second, pregnancy in a bicornate uterus; third, a retroflexed gravid uterus; fourth, spurious pregnancy; fifth, ovarian tumors; sixth, uterine tumors;

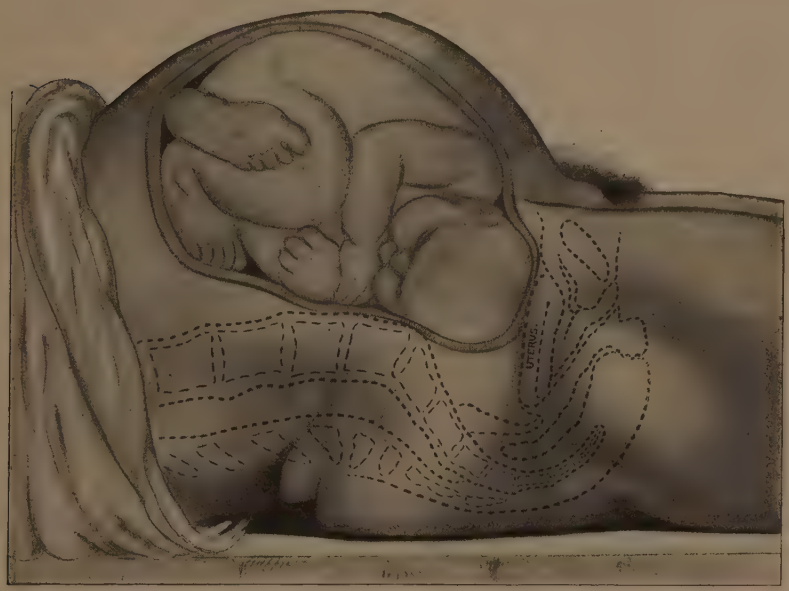


Fig. 430.—Large Ectopic Gestation Sac.

seventh, intraligamentary tumors; eighth, accumulation of feces in the rectum.

First, uncomplicated uterine pregnancy is generally more easily recognized by the change in shape and size of the organ. In ectopic gestation the jug-like shape or outline of the fundus is wanting. A sac or mass rather sharply defined will be found in one of the tubes, if rupture has not occurred, and the subjacent vessels will pulsate more distinctly than upon the opposite side. After rupture the condition is distinguished by more or less severe shock, profound anemia, and the appearance of a large mass in the pelvis without a history of previous inflammatory phenomena. The introduction of the sound

and the use of the curet to secure decidual tissue have been advocated, but are procedures which are not free from danger. In possible uterine pregnancy and abortion the danger of infection must not be overlooked. The investigation for decidua may be misleading, as it may have been previously exfoliated. The tissue removed by a curet cannot be certainly distinguished from that which will be caused by inflammation, and the procedure endangers the development of septic processes, which will complicate a tubal gestation if any exists.

Second, pregnancy in one horn of a bicornate uterus may be impossible to differentiate from a tubo-uterine or an interstitial pregnancy. Fortunately, the treatment of the two conditions is similar, and is almost equally urgent. A tubal gestation is situated at a greater distance from the uterus.

Third, the retroflexed pregnant uterus is recognized by palpation, in which we are able to trace the tumor back from the cervix, and the smoothly outlined fundus is capable of considerable movement.

Fourth, careful analysis of the symptoms, associated with the accurate consideration of physical signs, will guide to a correct diagnosis. It is a grave error to mistake, after the abdomen has been opened, an extraperitoneal pregnancy for sarcoma or myoma.

Fifth, ovarian tumors are usually differentiated by their history. It is only when one of these growths has produced no symptoms by which its presence could be suspected, and is suddenly complicated by an acute attack, during which or subsequent to which examination discloses its presence more or less fixed in the pelvis, that error is possible. Such a train of symptoms is readily produced by twisting of the pedicle of a small ovarian or a broad ligament cyst. A young unmarried woman came under my observation with a history of having had a severe attack of pain upon the right side, which was pronounced appendicitis. While a movable mass could be felt above the brim of the pelvis upon the right side there was no indication of inflammatory exudation. Notwithstanding the good character of the individual, ectopic gestation was regarded as a possibility. An abdominal incision disclosed a broad ligament cyst beyond the ovary, closely attached to the outer part of the tube, whose pedicle had twisted, causing hemorrhage into the cyst and twisted portion of the tube, with the effusion of a large quantity of bloody serum free in the peritoneal cavity.

Sixth, when, in an extra-uterine pregnancy, the fetus is dead, the fluid portions have been absorbed, and the mass is hard and firm, with its sac closely adherent to the side of the

uterus, the physical signs are frequently insufficient to establish the differential diagnosis between it and an intraligamentous myoma.

Seventh, intraligamentary tumors are easily confounded with ectopic gestation. Frequently the diagnosis can be determined only after abdominal incision. A patient was brought to me with the following history: She had been married nine years and had never been pregnant; six weeks before admission she was seized with severe pain in the left side, and subsequent inflammatory symptoms, which confined her to bed the greater portion of the time. A mass, quite resistant, was felt to the left and in front of the uterus, which was firmly fixed by adhesions. The long period of sterility, sudden onset, and more or less fixed tumor, not previously recognized, led me to suspect tubal gestation, with intraligamentary rupture. The incision, however, disclosed an intraligamentary ovarian cyst with thick walls, which had undergone a degenerative process, and which probably explained the sudden onset.

Not infrequently the diagnosis can be determined only by incision, and an ectopic gestation is found when operations are performed for other conditions, and the reverse.

Eighth, careful examination should exclude fecal accumulation; ordinarily, the latter condition is determined by the possibility of indenting the fecal masses. When there is any doubt, an expression of opinion should be withheld until a complete evacuation of the bowels can be secured through the employment of an active purgative, supplemented by free rectal enemata.

The differential diagnosis of tubal rupture is often difficult. Rupture is simulated by lesions of the abdominal viscera, such as perforating ulcers in the stomach, duodenum, small intestine, and vermiform appendix; rupture of a pyosalpinx; torsion of the pedicle of a small ovarian cyst; acute intestinal obstruction; renal and biliary colic. A case of tubal gestation has been brought to operation as a supposed strangulated hernia. The diagnosis of tubal rupture can always be rendered certain by a puncture through the posterior vaginal fornix, when the rupture will be indicated by the discharge of dark-colored blood. The vaginal puncture affords, in addition, opportunity for the digital exploration of the pelvic viscera. Such an investigation permits palpation of the tubes and ovaries and the recognition of existing abnormalities.

The following table, modified by Gregg Smith from Webster, presents in a convenient form a summary of the pathologic and clinical features of ectopic gestation:

A. AMPULLAR.—Gestation beginning in the ampulla of the tube.
  I. *Persisting* (rarely goes to full term).
  II. *Rupture* (the usual result):
    1. Into broad ligament:
      (*a*) Gestation continues there.
      (*b*) Secondary rupture into peritoneal cavity.
      (*c*) Gestation terminates:
        (*a'*) By formation of hematoma.
        (*b'*) By suppuration.
        (*c'*) By mummification.
    2. Into peritoneal cavity:
      (*a*) Gestation continues, the placenta remaining in the tube, the fetus and the membranes being in the cavity.
      (*b*) Gestation terminates:
        (*a'*) The patient dying from hemorrhage or shock.
        (*b'*) By absorption of the mass.
        (*c'*) By mummification or by adipocere or lithopedion formation.
  III. *Destruction of gestation:*
    1. By tubal abortion.
    2. By formation of mole.
    3. By hematosalpinx.
    4. By suppuration.
    5. By absorption after early death.

B. INTERSTITIAL, when the gestation develops in the interstitial portion of the tube:
  I. *Persisting* (the gestation may go on to term).
  II. *Rupture*:
    1. Into the peritoneal cavity.
    2. Into the uterine cavity.
    3. Into both the peritoneal and uterine cavities.
    4. Between layers of broad ligament.
  III. *Destruction of gestation and regressive changes in fetus and envelopes.*

C. INFUNDIBULAR, when the gestation is in the outer end of the tube. The ovary may form part of the wall of the sac.

484. Prognosis.—Extra-uterine pregnancy at any stage of its progress must be regarded as a condition pregnant with the greatest peril to the individual. It should be regarded as just as positive an indication for treatment as would be the presence of malignant disease. If discovered before the rupture of the sac, the patient is in danger from hemorrhage. The longer the condition progresses, the more grave is the peril. After rupture, with death of the fetus, the patient is not free from danger, as the collection of blood—the hematocele—may become infected, from its proximity to the hollow viscera, and cause the formation of an abscess or the development of pyemic symptoms. If the fetus survives the rupture, its subsequent development only increases the danger. A secondary rupture, with escape of the sac contents into the peritoneal cavity, or the frightful hemorrhages which result in some conditions, may prove immediately fatal. The woman goes on to full term; the fetus dies, then undergoes retrogressive processes, which may at any time, even after years of quiescence, become infected, resulting in the formation of abscesses,

perforation of viscera, and escape of the contents of the sac. As the nutrition of the fetus in the majority of cases is defective, from unfavorable implantation of the placenta, frequently from pressure upon it, the fetus is generally imperfectly developed, often undersized, suffering from hydrocephalus, spina bifida, club-foot, and other deformities. The preservation of the life of such an individual should not be considered when it is recognized that the life of the mother is constantly in peril. Furthermore, the fact that, even under the most favorable circumstances, the chances for the fetus are very greatly decreased, and that, even when delivered alive, its duration of life is short, should be taken into account. The statistics of Dunning indicate that an operation for the delivery of the child during life, when viable, is more favorable for the life of the mother than is the delay of the operation until after the death of the fetus.

485. Treatment.—In a condition fraught with such dangers as that of ectopic gestation it does not seem the province of the physician to practise any other method than one which will afford the greatest certainty of relief and which can be accomplished with the least danger. This, in our judgment, is through surgical manipulation; but, as other methods of treatment have been advocated, before entering upon the consideration of extirpation we will consider the substitutes. The substitute methods recognized are evacuation of the liquor amnii, injection of poisonous substances, elytrotomy, and the application of the electric current.

The evacuation of the liquor amnii was advocated by Simpson in 1864. He treated a case by puncturing the cyst through the vagina without killing the child, and the mother died in three days. Braxton Hicks tried a similar method in 1865, which killed the child, but the mother died of hemorrhage. Greenhalgh, in 1867, had a successful case. James, of Philadelphia, in 1867, had a successful case after much tribulation. This plan of treatment, owing to the great mortality, has been generally abandoned.

The injection of poisonous materials into the fetus and its enveloping fluids was advocated by Joulin in 1863. Morphin is the drug most frequently used. Other remedies, such as strychnin and ergotin, have been similarly employed. Inunctions of mercury and iodid of potash and repeated bleeding have been advocated, but it is difficult to explain why. The injection of morphin with a hypodermic syringe is practised before the fifth month. Two injections are usually given, containing $\frac{1}{2}$ of a grain each, at an interval of from eight to fifteen days. The treatment may result in severe hemorrhage,

septicemia, and perforation of an intestinal loop, so that, while apparently a simple procedure, it is attended with greater danger than an abdominal operation.

Elytrotomy, or the removal of the fetus and its contents through a vaginal incision, was instituted as early as 1817 by Dr. King, of Georgia. This operation, which has been lately revived, is not by any means a new one. In the discussion of hematocele vaginal incision has been advocated as a justifiable method of procedure when the condition has become chronic; in other words, some time after the hemorrhage has taken place, when the vessels are occluded and the fetus is more than likely to be dead. In such cases vaginal incision affords an opportunity for clearing away the debris without subjecting the patient to so serious an operation as would be that through the abdominal wall. But before rupture, or immediately following rupture, in order to arrest the hemorrhage, the abdominal incision should be preferred. When the patient has reached full term, and the death of the fetus has occurred, but as yet without the appearance of suppuration, the vaginal procedure may be chosen: (1) When the fetus presents the head, breech, or feet, so that it can be extracted without altering its position; (2) when it is certain, from the thinness of the structures separating the presenting part from the vaginal canal, that the placenta is not situated over this part of the sac, and we are not absolutely certain that the placenta may not be inserted on the anterior abdominal wall. If it is necessary to turn the child in order to deliver it, the vaginal procedure should not be considered. Robertson advocates dividing the perineum, septum of the vagina, and rectum, but this is an unnecessarily severe proceeding.

The application of electricity for the destruction of the fetus has been practised since 1853. There is a difference of opinion, however, among electrotherapeutists as to the greater value of the faradic and galvanic currents, each having its advocates. This procedure is preferable to all those which have been named, but is advisable only in the earlier months of pregnancy. In the early stages we must take into consideration the fact that the diagnosis is not always certain. Without doubt, many of the cases reported to have been cured by electricity were cases which had undergone rupture, and in which the tubal mole or embryo had escaped and lost its vitality, and the electric treatment has possibly served to expedite the absorption of the exudation—an absorption which would have taken place had electricity not been applied. Many cases in which electricity has been applied were undoubtedly cases of mistaken diagnosis. It is true that advanced methods

of examination will more certainly differentiate the condition, but the violence required to accomplish this will greatly endanger the rupture of the fetal sac. The application of electricity has occasionally been found to intensify the contraction of the muscle-fiber of the tube and to result in rupture and severe hemorrhage. When the death of the fetus occurs the danger does not cease, and we will frequently find the placenta continuing to grow, or rupture may follow, associated with severe hemorrhage and later with septicemia. In the application of the current one pole of the battery, generally the negative, is applied through either the rectum or the vagina in the neighborhood of the ovum. The other pole or a large electrode is applied to the abdominal wall directly over the sac and an inch or more above Poupart's ligament. The current is used for from five to ten minutes, increasing it as the sensitiveness of the patient will permit. When necessary, the application should be repeated. The practice of this procedure is of doubtful utility, and, as has already been mentioned, it is not without danger. It temporizes with a condition which menaces life and may excite severe tubal contractions which often result in rupture with subsequent hemorrhage.

The risks and difficulties of operative treatment will largely depend upon the stage of gestation and the condition of the placenta and gestation sac. The surgeon, to be properly prepared to meet all emergencies, should consider the following: (1) The measures to be employed before primary rupture or abortion; (2) the measures required at the time of primary rupture; (3) what shall be done for the patient coming under observation subsequent to rupture, (*a*) with intraperitoneal hemorrhage; (*b*) with extraperitoneal hemorrhage; (4) the method of treatment advisable in advanced growth of the embryo, (*a*) the child alive; (*b*) the child dead, mummified, or reduced to a lithopedion; (*c*) following decomposition of the fetus and suppuration of the sac.

1. *The Measures to be Employed before Primary Rupture or Abortion.*—Cases in which opportunity is afforded to operate prior to the rupture of the sac are more frequent than formerly, owing to our improved methods of diagnosis and to the greater significance given to disorders accompanying the pregnancy. Too frequently, still, the disorder will be overlooked until the danger-signal of rupture appears. When the symptoms present make it evident that an ectopic gestation exists or is extremely probable, the patient should be subjected to operation at the earliest possible moment. The danger arising from rupture is so great that the patient should be considered in peril of her life until the condition is corrected. The abdominal

incision is the preferable procedure, inasmuch as it affords a better opportunity to explore the field, to manage adhesions, and to secure bleeding vessels. The removal of the entire sac rarely affords any special difficulty. In a tubo-ovarian pregnancy it is possible that a knuckle of intestine may have become adherent to the sac. In such cases the removal of the latter must be carefully managed, because the changes which take place in the adherent intestine render it easily torn. Failure to recognize this possibility in my own experience led to the necessity of resecting a knuckle of intestine for an extensive tear. The patient, however, fortunately recovered.

2. *The Measures Required at the Time of Primary Rupture.*—Unfortunately, the attention of the physician is much more frequently directed to the occurrence of primary rupture or abortion rather than to the existence of an ectopic gestation prior to this event. Very frequently the efforts employed to arrive at a correct diagnosis may be the means of the production of this catastrophe. Therefore, I would again emphasize the importance of delicate manipulation in a case of suspected ectopic gestation. Indeed, prior to the careful examination of a patient in whom an extrauterine pregnancy is suspected, it would be well to have ample provision for resort to immediate surgical procedure, in the event of collapse or rupture of the ectopic sac. Should the disaster occur during an examination, or the physician be called upon to attend a case in which rupture had recently occurred, he should endeavor to keep the patient perfectly quiet and free from annoyance, with her clothing loosened. The foot of her bed should be elevated and a hypodermic injection of morphin should be administered with a view not only to quiet the pain, but to lessen the nerve irritability and restlessness. An ice-bag should be applied over the abdomen and immediate preparations made for opening the abdomen, in order to secure the bleeding vessel. The patient should be placed under the influence of an anesthetic. If the operator is at all in doubt as to whether the condition has resulted from an internal hemorrhage, he may confirm his suspicions and satisfy all scruples by cleansing the vagina and making a puncture through the posterior fornix, which will permit the recognition of the escaping blood. Indeed, through such a puncture the tubes may be examined and the presence of the sac recognized. Moreover, a skilful operator may be able to secure the bleeding vessels through the vaginal incision. Indeed, it has been advocated that the ruptured tube should be brought down, the surfaces cleansed, and sutures so introduced as to control the bleeding vessel and close the opening, leaving the tube in place. Such a plan

of procedure, however, is inadvisable. The fact that the caliber of the tube is so obstructed as to have caused an ectopic pregnancy would indicate that its retention must necessarily subject the patient to the danger of a recurrence of the condition. The abdomen opened, the bleeding vessel secured, with aseptic precautions, no great effort need be made to free the peritoneal cavity of blood, for, if the patient is kept under proper regimen, the blood is quickly reabsorbed and serves in some degree to sustain and support her. The absolute indication at this stage is to arrest the hemorrhage, and this is most effectively accomplished through an abdominal incision. As soon as the abdominal incision is made there will be a gush of blood. The pelvis will be found more or less occupied with blood-clot; do not stop to turn out the clots, but proceed through the clotted blood to the fundus of the uterus and along either tube to discover the sac. The site of the gestation is recognized as a soft, boggy enlargement of varying size and consistency, according to whether the ovum is, or is not, *in situ*. The sac is brought up and examined for the rent. When the hemorrhage is marked, the pedicle is at once secured with pedicle forceps until the cavity can be cleansed and ligatures applied. After ligation the sac is cut away. If the patient is very profoundly anemic, no time should be lost by attending to the toilet of the abdomen, but it should be simply irrigated with normal salt solution to carry away the principal clots.

3. *The treatment of the patient subsequent to rupture*, (*a*) with intraperitoneal hemorrhage. The patient, having rallied from the shock, will in very many cases recover without operative interference by keeping her perfectly quiet, promoting drainage through the intestinal canal by frequent purgation, and limiting the amount of food and drink that is given. She is thus obliged to live upon her tissues, which will promote the absorption of even a large collection. As we have already seen, the tube which has been the seat of an abortion will generally be found distended with clots, and the same material will fill up the retrouterine pouch. The convalescence of the patient will generally be enhanced by the removal of the tube and the clotted blood. This is particularly true when the tube is the seat of a perforation from the villi, for frightful hemorrhage may be found, and, besides, under such conditions it is likely to continue. Even when the hemorrhage arises as a result of rupture, we are not certain that the clot which plugs the vessels may not be loosened and a recurrence of bleeding follow. In spite of every precaution that may be observed it is not infrequently found that a collection of blood in the peritoneal cavity becomes infected from its proximity to the intestine,

and thus a suppurative process is engendered, which prolongs the patient's convalescence. Even should this not occur, the blood-clot, becoming organized, gives rise to thickening, extensive adhesions, and more or less crippling of the function of the pelvic organs for the remainder of the patient's life. If the patient comes under observation some days subsequent to the evident rupture, thus affording sufficient time for the vessels to become occluded by clots, and with an accumulation of blood in the pelvis, which frequently is walled off by plastic exudate from the general peritoneal cavity, the preferable plan of procedure would be to make a free incision into the vault of the vagina. Two fingers should then be introduced through this opening, the clots broken up and evacuated, the cavity thoroughly irrigated with normal salt solution and packed with iodoform gauze. The tube may frequently be brought down and secured by ligature or clamp between the seat of rupture and the uterus, and the mass be thus removed. This is particularly true when the tube is occupied by a large blood-clot. When the tube is situated high up in the side of the pelvis or the lower part of the abdomen, and in a position not readily accessible through the vagina, the abdominal incision is preferable, as it affords a better opportunity to inspect the condition of the pelvic organs, to remove the occluded tube, and, if necessary, the associated ovary. It has been urged that where one tube has been the seat of an ectopic gestation which has ruptured and led to operative interference, the other tube should likewise be removed in order to prevent the possible occurrence of an ectopic gestation within it. The many cases in which a normal intrauterine pregnancy has followed a tubal pregnancy would render such advice unwise. While numerous cases are recorded in which an operation for the removal of an ectopic gestation has been followed by the occurrence of gestation in the remaining tube, this, however, is not the rule, and it would be just as logical to forbid matrimony because an occasional marriage is unfortunate.

(*b*) Extraperitoneal hemorrhage is a result of rupture of the tube between the folds of the broad ligament. A hematocele is thus produced which is situated in the cellular tissue between the layers of the peritoneum. The amount of hemorrhage is necessarily limited by the size of the vessel opened, the blood pressure, and the distensibility of the structure into which the hemorrhage has occurred. Where the collection is small, it may be sufficient to treat the patient expectantly, watch her progress, and trust to nature to absorb the exudate. Even in this condition it shouid not be forgotten that in rare cases the embryo may survive the accident and continue to

grow. The continuation of the growth of the fetus presents additional and more serious problems. Prior to the fourth month the embryo, tube, ovary, and adjacent portion of the broad ligament, including the placenta, can generally be removed. Subsequent to this period, however, the placenta may have attained such a size as to render its removal difficult. Not infrequently the life of the patient is endangered by a subsequent rupture. The placenta extends upon the pelvic surface, covering over and surrounding the vessels, and the ureter. Moreover, the intestines may aid in forming the sac wall of the developing embryo and a condition result which would render any operative interference exceedingly serious. Where the patient shows marked symptoms of internal hemorrhage and an examination reveals a collection of large size, an immediate operation is preferable, for the depressed condition of the patient increases the danger of infection of the effused blood from the walls of the adjacent intestine. When infection enters the sac, suppuration will follow. This, of course, greatly endangers the life of the patient. Early interference with such a collection is preferably made through the abdomen, for the reason that it affords a better opportunity of exposing and securing the bleeding vessel. Having opened the abdomen, the peritoneal cavity so far as possible should be carefully walled off with a large quantity of gauze, the blood-clots evacuated, and the bleeding vessels searched for and secured. If the blood collection has been a large one and the pelvis is covered with adherent blood-clot, an opening should be made into the vagina, through which the end of a piece of gauze sufficient to fill the cavity should be carried. When the collection has been extraperitoneal, the abdomen can be walled off with gauze before the broad ligament is opened, the clots should be turned out, the bleeding vessel secured; the cavity packed with gauze, the end of which has been carried through an opening in the vagina, thus allowing the peritoneal wound to be closed. Care must be exercised, however, in this procedure not to injure the uterine artery or the ureter.

4. *The method of treatment advisable in advanced growth of the embryo*, (*a*) the child alive. From the fourth month to the completion of pregnancy the existence of a quick placenta presents a condition which is generally regarded as the most dangerous in the whole realm of surgery. The sac has ruptured, the placenta has formed new and more extended attachments. While the condition of the patient can not be considered otherwise than grave, the immediate danger is not so great but that we can afford to wait until a later stage of the pregnancy for interference and thus give the fetus a chance for its life. The

existence of the live placenta, and the profound hemorrhage which results from any effort at its removal, have led many operators to question the advisability of any operative procedure while the child is alive. Some have advocated securing the death of the child by injecting into its body poisonous materials, such as morphin, or, when near the completion of the pregnancy, awaiting its death. They have justified this course of action by the assertion that in the great majority of cases the product of ectopic gestation is puny, ill developed, and often malformed, and that even when it survives extraction it usually lives but a few weeks, or at most months. Therefore they claim that the life of the mother should not be endangered to insure the life of a defective child. Experience, however, has disclosed that the extrauterine fetus may be well developed, and when it is evident that the mother can only be saved by operative procedure, it seems cowardice that this should not be employed at such a stage as will give the other being an opportunity for continued existence. Fortunately, the investigations of Dunning have demonstrated that the maternal chances are enhanced by operation during fetal life. The recognition of extrauterine pregnancy, then, should lead to the preparation for operation at a certain definite time prior to the completion of the gestation, preferably at about eight and one-half months. In resorting to operative procedure we must consider it from two additional standpoints: (1) As to the treatment of the sac; (2) the method of disposition of the placenta. The sac is composed of remnants of the expanded tube or of the broad ligament, thickened and in parts expanded. In some places coils of intestine or the adherent omentum also enter into its formation. The removal of the sac, consequently, is fraught with danger, not only to the adjacent large blood-vessels and ureters, but to the abdominal viscera in general. When the pregnancy has passed the fifth month with ample evidence of a living child, we would advise that interference be postponed until after the eighth month. It should be undertaken, however, not later than at eight and one-half months, in order to afford the fetus the best opportunity for its life. The operator is compelled to adapt his procedure to the condition immediately confronting him. The position of the fetus has been recognized and carefully outlined. In the majority of cases the median incision affords the best opportunity for the delivery of the fetus and the management of the sac and placenta. Having entered the peritoneal cavity, the sac is carefully examined and efforts made to avoid injuring the placenta. Where it is situated in front we should endeavor to open the sac on one side. After opening the sac the most

available part of the fetus is seized and delivered quickly. The cord is clamped with two hemostats and cut between them. The fetus is then removed and given to an attendant to be cared for. We now come to the decision of the question we have already mentioned, namely, the management of the sac and the disposition of the placenta: (1) The sac, as already mentioned, is composed of remnants of the distended tube or the broad ligament, thickened and in parts expanded. In other places coils of intestine or portions of the adherent omentum assist in forming it. The removal of the sac, consequently, is fraught with great danger, not only to the adjacent large blood-vessels, but to the viscera and ureters. The preferable plan is to incise the sac, remove the fetus, and stitch the edges of the former to the abdominal wound. In well-advanced pregnancy we may possibly be able to push the peritoneum from the anterior abdominal wall and to penetrate the sac without opening the peritoneal cavity, but the chief difficulty would be to determine (2) how we shall manage the placenta. The method employed will entirely depend upon its situation. Its management is most promising when situated in the pelvis below the fetus. When above the fetus, the placenta may be injured and result in furious bleeding or, indeed, even death of the patient. Even prompt seizure and ligation of the uterine side of the sac may fail to arrest the bleeding. The abdominal aorta may then be compressed, the cavity packed with sponges, and an application made of perchlorid or persulphate of iron. The danger of bleeding has frequently induced surgeons to leave the placenta and allow it to slough away, employing proper measures for securing external drainage. When the removal of the placenta can be accomplished without too much risk, it should be done. In addition to avoiding the placenta in opening the fetal sac, we should exercise the precaution to prevent discharge of the amniotic contents into the peritoneal cavity. After delivery of the fetus the operation is completed in one of three ways: (1) The extirpation of the entire sac; (2) the removal of the placenta without the sac; (3) the retention of the placenta and the sac.

1. Whenever it can be safely accomplished, the entire sac should be removed. By this method the operation is more complete and convalescence is more likely to be insured. This can be accomplished whenever we can construct a pedicle and the sac wall is made up of tissue that can without disadvantage be removed. The pedicle may be narrow or broad, as in an ovarian cyst.

2. *Extirpation of the Placenta with the Sac Remaining.*—The placenta should be removed whenever it can be peeled out

without hemorrhage, or when it is so situated that the vessels supplying it can be securely ligated and the mass removed, or when its position is such that effective control of hemorrhage can be accomplished by tampons of iodoform gauze. After removal of the placenta the gauze may be removed and replaced by a large drain.

3. *The Retention of the Placenta and Sac.*—When the placenta is firmly attached or it is evident that its detachment would result in dangerous hemorrhage, it should not be disturbed. The operator should exercise the greatest care in the management of the live placenta, as the hemorrhage in such cases is frightful and exceedingly difficult to control. Where the placenta is partially detached it may be necessary to proceed with its removal. This should be accomplished quickly, making firm pressure over the parts with iodoform gauze. If the attachment is of such a character as will permit, the parts should be quilted together by a ligature which is tied firmly around the base of the placenta. Where it is necessary to retain the placenta and the sac, one of the following methods can be practised: The sac can be fixed to the abdominal wall and the cavity drained, or the opening in the sac can be closed, covering over the placenta and shutting off the latter from the peritoneal cavity. In such cases the cord should be cut off close to the placenta, after previous ligation with chromic catgut, or the electro-angiotribe can be employed. This instrument appeals to me as an efficient means of controlling hemorrhage and insuring the removal of a portion of the placenta. To accomplish this, it will require a modification of the angiotribes at present in use, employing one with a more flattened surface, thus allowing a good portion of the placenta to be subjected to the slow action of heat. The placenta and sac should be closed and returned to the peritoneal cavity only when we have been able to secure absolute and rigorous antisepsis. The presence of a single microbe may lead to putrefaction of the placenta and suppuration. The disadvantages of the retention of the placenta are that its separation and discharge are tedious and present continuous risks of septicemia and peritonitis. Fecal fistula may form. These risks are decreased by irrigation of the sac, by the ligation of the cord close to the placenta without disturbing the latter, by carefully sponging the cavity, and then, as has been suggested, by hermetically closing it. Even though we are able to exclude the germs from the cavity, it must be remembered there is danger of their entrance through adhesions to the intestines. Intestinal micro-organisms may gain access to the placenta and produce decomposition. The following rules have

been formulated by Sutton: (1) When the placenta is situated above the fetus, attempt its removal; (2) if the placenta has become partially detached during the course of the operation, no choice is left but its removal; (3) the placenta below the fetus can be left; (4) if the placenta is left, the sac closed and subsequently symptoms of suppuration occur, the wound must be at once laid open and the placenta removed.

(*b*) *The Child Dead, Mummified, or Reduced to a Lithopedion.*—The death of the child at any stage results in very early arrest of the circulation in the placenta. The continuation of the growth of the placenta after the death of the fetus has been considered as a possibility, but this is very improbable. The placenta does not decompose, but undergoes slow and complete atrophy. The vessels in the maternal portion atrophy and disappear. This, consequently, leaves much less of the placental structure than would be found in an extrauterine pregnancy. The absorption of the placenta continues until, in those cases in which the lithopedion is formed, the placenta is found to be entirely absent. Should the patient come under observation when the history would lead us to suspect that the fetus has but recently perished, it would be wise to postpone operation a few weeks later, when arrest of the circulation in the placenta may become complete. The sac is exposed by the abdominal incision, the general peritoneal cavity is well protected by gauze packing and care exercised that the contents of the sac shall be removed without soiling the peritoneum. The escape of the contents into the peritoneal cavity should be prevented by the employment of an aspirator and the environments of the sac should be carefully guarded with sponge packing before it is opened. The fetus is withdrawn and the sac then examined, with a view to its removal, if possible. Where the condition will admit, the entire sac, with the enclosed placenta, should be removed. If knuckles of intestines are adherent to the sac, the greatest care should be exercised in their separation, in order to avoid inflicting injury to them. Where the adhesion is very firm, the separation should be made at the expense of the sac wall, leaving a portion of it attached to the intestine. When a large portion of the intestine enters into the formation of the sac wall, the removal of the sac will not be feasible. In such cases the placenta should be peeled out, the cavity thoroughly sponged with carbolic acid and afterward with alcohol, dried, packed with gauze, and its edges stitched to the abdominal wound. Where the sac is dependent and in close approximation to the Douglas' pouch, an opening should be made through its base into the vagina, through which drainage may be effected and the upper part of the sac closed.

The vaginal drainage of the sac should be employed whenever possible, as the drainage is from the most dependent portion and the convalescence of the patient is much shorter and the dangers of subsequent ventral hernia greatly decreased. Following the death of the fetus marked changes occur. The fetus itself may become mummified, its watery portions absorbed, forming a flattened mass. Or, again, the entire fetus undergoes a substitution of fat for its original structures, forming a lardaceous condition; or, again, we may have the fetus and its sac filled up with calcareous deposit, causing a rather dense, hardened mass. Some of these conditions may continue for years. A lithopedion has been found in a woman of ninety. Their presence, however, always predisposes to infection, which may result in suppuration, with subsequent discharge of particles of the calcified mass. Wherever possible, the entire mass should be removed. Wherever it is recognized, after an abdominal incision, that the mass has formed extensive adhesions to the intestines and other structures of such a character as to preclude the probability of successful removal, the sac should be opened, its contents so far as possible removed, the sac wall stitched closely to the abdominal wound and its cavity packed with gauze. The removal of the fetus and the drainage of the sac result in its complete obliteration and the restoration of the patient to health.

(*c*) *Following Decomposition of the Fetus and Suppuration of the Sac.*—Decomposition of the fetus and suppuration of the sac are indicated by symptoms of inflammation, the sac becoming tender to pressure with evidence of localized peritonitis. The temperature of the patient will be elevated, possibly recurring chills, night sweats, progressive emaciation, and symptoms of low continued fever will be manifest. Liquefaction of the sac by pus formation causes thinning and even rupture of its walls, with the escape of its contents into the peritoneal cavity, the bladder, the intestine, the vagina, or through the abdominal walls. The rupture results in the formation of a sinus, through which often will be found passing fragments of small fetal bones. The existence of suppuration should be considered an indication for immediate operation. To open the sac without entering the peritoneal cavity is, of course, more satisfactory, and this occasionally can be accomplished. If the adhesions between the peritoneal surfaces are not extensive, the opening may be a small one, and by gauze packing and other means the adhesions may be extended. Where parietal adhesions do not occur, the sac should be opened and its contents thoroughly evacuated, but the peritoneal cavity must be thoroughly protected from soiling by gauze

packing. Every fragment of bone should be removed, for otherwise the obliteration of the sac will not take place and suppuration will continue as long as the irritation remains. In the convalescence the cavity of the sac should be thoroughly packed with iodoform gauze and the sac itself be stitched to the skin edges. During the convalescence the cavity should be frequently irrigated with antiseptic fluids. We may sometimes be able, especially where the opening has taken place through the abdominal wall, to dilate the sinus and empty the sac without opening into the general peritoneal cavity. This method of procedure can be effectually employed in the opening through the abdominal wall and the vagina, but openings into the bladder or intestine will require abdominal operation. However, efforts should be made to remove the sac, if possible, and to close the intestinal or vesical openings.

GENITAL TUMORS.

486. Definition.—A tumor of the genito-urinary tract is a distinct swelling or protuberance which may develop upon or within any portion of either the genital or urinary structure.

Any inflammatory swelling is a tumor, but the term is here confined to such swellings as are circumscribed and can be more or less definitely differentiated, have a marked course, and are rarely associated with febrile symptoms. The division of these tumors into two great classes, the benign and malignant, is of classic origin, and the clinical importance of such a classification of growths of the genitalia is equal to that in any other portion of the body.

A benign tumor is one in which the course of development is local, the progress not destructive to life, and no tendency to recur exists after its removal.

The malignant tumor, on the contrary, in its march of invasion, little by little infects the entire organism, and shows a marked tendency to relapse after surgical intervention.

The study of the structure of growths shows a marked difference in the cellular tissue of the two classes, each having well-defined tissue changes, which render them recognizable, and from which the future progress may be predicated.

In the differential diagnosis it is often difficult to draw the line where the benign terminates and the malignant begins.

In some of the uterine and ovarian growths, particularly of the glandular varieties, we are forced to rely upon the subsequent progress for the determination of the proper classification. Notable examples are the glandular and malignant adenomas of the uterus and the papillomas of the ovary.

In the consideration of the subject we will, for more ready comparison, study separately the tumors, benign and malignant, of each portion of the tract.

VULVA, VAGINA, AND BLADDER.

487.—The tumors of the vulva and vagina may be divided into cystic and solid. The cysts may contain either gas or liquid. All varieties of tumors are comparatively rare both in the vulva and the vagina.

Fig. 431.—Anterior Labial or Inguinal Hernia.

488. The gaseous cysts are hernias which present in the vulva in two varieties, the anterior labial or inguinal, and the posterior labial. The anterior labial hernia is analogous to the scrotal hernia in the male. It is formed by a portion of intestine or omentum descending through the inguinal canal and distending the large labium (Fig. 431). This form of

hernia is comparatively rare in women. Femoral hernia is much more frequent in the female. In the latter the hernial sac emerges below Poupart's ligament and makes its exit as a lump in the groin, which, as it increases in size, pushes up over the ligament. In the sac of an inguinal hernia has been found an ovary and tube and even the fundus of the uterus. Instances have been recorded of an ovarian cyst or a tubal gestation complicating such a hernia. The posterior labial

Fig. 432.—Posterior Labial Hernia.

hernia (Fig. 432) is formed by the intestine driving the peritoneum through the pelvic aponeurosis and the levator ani muscle. The sac appears at the side of or projects through the vulvar orifice. Labial hernia may sometimes be difficult to differentiate from hydrocele or a fatty tumor of the labium. A double hernia with an ovary in each labium associated with a large penis-like clitoris may cause some doubt as to the sex of the

individual. In hydrocele a sensation of fluctuation is more distinct, the sac thin, the tumor quite translucent, and accompanied by few, if any, distressing symptoms. The hydrocele, though evanescent when the canal of Nuck is open, is usually more continuously distended than is a hernia. A woman recently sent to me for diagnosis presented a tumor, the size of an orange, which occupied the left labium, was elastic, quite movable, and afforded a sensation of a hernia of the omentum. Careful investigation revealed that it was a lipoma of the labium and presented no indication of any thickening along the inguinal canal, which would necessarily have been the case had the tumor been a hernia.

The symptoms and treatment of hernia will be found in any surgical work.

489. Liquid cysts naturally occur in a region so well provided with glands as is the vulva. The retention cysts of the gland of Bartholin (Section 322), and *hydrocele*, a serous cyst formed by the gravitation of serum through the open canal of Nuck into the large labium, are the most important. Hydrocele is analogous to the serous collection in the scrotum of the male. The sac is thin-walled, quite translucent, and affords a distinct sensation of fluctuation.

When the canal of Nuck is patulous, the tumor can be made to disappear by elevation of the pelvis or under pressure. From hernia it is distinguished by the absence of any thickening along the inguinal canal; its translucent appearance; the presence of fluctuation; and the failure of the tumor to increase in size during coughing.

Treatment.—The contents can be readily removed by puncture, but re-collect rapidly. Obliterative inflammation may be engendered after removal of the fluid by injecting some irritating agent and bringing it in contact with the entire cavity of the sac, but care must be exercised to prevent it being forced through an open canal into the peritoneal cavity. A more satisfactory procedure will be to make a free opening into the sac and pack it with iodoform gauze.

490. Sebaceous cysts rarely attain to any size. They are found upon the labia majora, the labia minora, in the sulcus between them, about the clitoris, over the mons veneris, and sometimes upon the edge of the hymen.

491. Blood cysts are occasionally found. These may originate in a preexisting hematoma, through a hollow, round ligament (Koppe), in the sac of an old hernia, in the site of a thrombus, or from dilatation of lymph-vessels.

Cysts are also found in the hymen—Döderlein says, from fusion of adjoining surfaces; in the urethra, either from ob-

literation of Skene's glandules or the dilatation of a terminal and unobliterated vestige of Gärtner's duct.

Hematoma of the vulva and vagina has been described. (Section 465.)

Abscess. (Section 322.)

492. Erectile or **vascular tumors** are rare in the labium, but when they occur, present characteristics similar to those in other portions of the body. Vascular growths about the urethra are much more frequent. Pozzi indicates that the hymen is not the simple isolated structure surrounding the vulva, but comprises, first, the masculine frænum vestibuli; second, the ring inclosing the urinary meatus; and, third, the hymen. The structure is the undeveloped matrix tissue of the corpus spongiosum in the male, and has not become erectile. These considerations, he asserts, throw light upon the origin of some of the vascular growths of the urethra and meatus. The retention of the erectile tissue in the female, which is normal in the male, results, through efforts at micturition, in the formation and extrusion of a polypus, known as a *urethral caruncle.*

Fig. 433.—Urethral Caruncle.

A *urethral caruncle* appears as a bright red, fragile looking projection from the urethral orifice. It is largely composed of dilated capillaries with a small amount of connective tissue and is covered with pavement epithelium. In a recent study of some microscopic sections of these growths I discovered the presence of glandular structure quite well marked. The growth is amply supplied with nerves, which are more or less exposed. The structure of the growth accounts for its vascularity and great sensitiveness (Fig. 433).

Etiology.—The growths may occur at any age. They are frequently seen in young children, are more frequently found in middle life, and have been seen in women as late as the seventy-fifth year. They occur with about equal frequency in the married and unmarried.

Symptoms.—The growth usually projects from the urethral orifice and is generally situated upon the posterior wall. Separating widely, the vulva causes the tumor to be pushed forward and rendered more prominent. Its sensitiveness varies with different individuals. In some it produces no marked symptoms, while others complain of continuous burning, a sensation of fullness in the urethra, and marked pain during and for several minutes following urination. Occasionally the distress is so marked that the act of micturition is prevented and the employment of a catheter is rendered necessary. Its extreme sensitiveness frequently causes it to be a barrier to the sexual relation, hence it is one of the causes of dyspareunia.

Fig. 434.—Prolapsus Urethræ.

Diagnosis.—The tumor is readily recognized by its bright red appearance, its extreme sensitiveness, and its fragility. A varicose condition of the urethral vessels may occur, but this is characterized by bluish projections from the urethral orifice, which are plainly recognized as distended veins, somewhat resembling hemorrhoids about the anus. A prolapse of the urethra may exist, but this condition forms a rounded projection which partly or completely encircles the urethral orifice (Fig. 434).

Treatment.—The only treatment that affords any hope of success is excision. This may be done under cocain anesthesia, the mass picked up and cut off at its base with scissors, and

bleeding arrested by coaptating the surfaces with a suture. It is much more satisfactorily accomplished, however, under general anesthesia, as the patient is then quiet and the manipulation can be more deliberate. The excision of the mass with scissors and the application of the thermocautery to the base are very efficient. In the employment of the thermocautery a wooden rod the size of a catheter should be previously introduced to preserve the urethra from destruction. Especial care must be exercised to control the hemorrhage, as I have seen frightful bleeding occur from such an operation.

493. Varicose Veins.—Varicose veins of the vulva are not infrequent during gestation. (Fig. 435.) Holden reports a

Fig. 435.—Varicose Veins of the Vulva.—(*Dr. W. Krusen.*)

case in which the labia majora were the size of a fetal head. The patient died of phlebitis. The tumor presents a bluish color on the surface of the integument, violet on the mucous surface, and gives rise to a sensation of weight in walking or when the patient is in the upright position. The rupture of such a tumor may cause serious or even fatal hemorrhage. The patient should be cautioned to wear her clothing loose, having no constriction about the waist, and the varicose parts should be supported. The most effective treatment is the excision of the principal veins.

494. Neuroma of the vulva is a rare condition. Painful

nodules are occasionally recognized, and their presence occasions vaginismus.

Treatment would be to excise the painful spots.

495. Simple Vegetations.—Vegetations appear upon the vulva in the form of papillomata or condylomata, occasionally having the appearance of a cauliflower. They may be situated at the edge of the vulva in isolated projections, or may cover by a voluminous growth the whole surface of the external genitalia. The mass may extend backward around the anus, and may attain the size of a fetal head. The growth presents a pale red color, often a deep wine tint, and is situated upon the vulva, perineum, and margin of the anus, sometimes extending forward over the mons veneris and over the inner surface of the thighs. (Fig. 436.) A profuse leukorrheal discharge is generally present, which is retained by these vegetations, and causes an extremely disagreeable and fetid odor. The decomposing discharges irritate the surface, which becomes greatly inflamed by walking and exercise, and are generally considered an indication of venereal infection, produced by either gonorrheal or syphilitic virus. Transmission of the disease has been observed by contact. The presence of vegetations, however, is not always an indication of specific infection, as these growths arise in pregnant women from a simple leukorrhea. The surface upon which they are implanted may become thickened by inflammation, undergo ulceration, and be covered by a glairy, fetid mucus which increases the resemblance to malignant disease. A vertical microscopic section, however, will reveal the true character. In the vegetations are dilated tree-like capillaries embedded in connective tissue, and covered with several layers of epithelium, thus presenting a marked contrast to the nests or tubular masses of epithelium embedded in connective-tissue stroma, which indicate the presence of epithelioma.

Treatment.—Keep the parts thoroughly clean, irrigate with bichlorid solution (1 : 2000), and dust the surface with equal parts of alum and sugar or paint it with carbolic acid. When the vegetations are very extensive, the most effective method of treatment is to place the patient under an anesthetic and with scissors cut away the vegetations; cauterize the base with nitric or chromic acid, or, still better, with the thermocautery, and subsequently keep the parts clean and dusted with drying powder. The convalescence will be rapid. When pregnancy exists, it need be no barrier to the method of treatment indicated, as the danger to the patient from sepsis following the delivery is much greater than any that could result from the treatment.

The operation can be done after saturating the parts with a 10 per cent. solution of cocain. Their removal by the curet has been advised, but the scissors affords a cleaner and more

Fig. 436.—Vulvar Vegetations.

effective instrument. This method produces less irritation of the subjacent skin. The hemorrhage may be controlled by the application of a strong solution of persulphate of iron, but

the thermocautery will prove more satisfactory. The burning of the latter can be lessened by the application of a compress wet with a 5 per cent. solution of carbolic acid. The application of a 10 to 40 per cent. solution of formaldehyde two or three times will cause the vegetations to slough, but this is a painful application.

496. Edema.—Anasarca is frequently accompanied by extensive swelling of the labia. The cause is readily recognized by the associated condition. When edema exists without general dropsy, it is indicative of some obstruction to the circulation in the pelvis. Edema confined to one labium is generally the result of injury or inflammation. A hard, dense exudation in one labium will usually be found to be due to a hard chancre, situated upon the same side at the margin of the vagina.

497. Solid Tumors.—Elephantiasis.—Elephantiasis consists in chronic inflammation of the lymphatics, with dilatation of their canals. It is very rare in our climate, but is more likely to exist in hot climates. The cause of the condition is unknown. The affection consists of more or less considerable hypertrophy of the entire vulva, sometimes localized in certain regions, as, for example, in the clitoris. The large hypertrophied labia, form voluminous masses, which may exceed the dimensions of of an adult head. (Fig. 437.)

Three forms are described: first, the entire derma is hypertrophied, with vast dilatation of the lymph-spaces; second, the engorgement of the lymph in the capillaries and large trunks; third, the lymphatic ganglia become the seat of fibrous alteration.

Symptoms.—The enlargement is frequently so great that walking and urination are interfered with. Friction of the surface leads to ulceration, which is slow to heal. The thickened tissues invade the vulva, and the perineal and anal regions, and form enormous tumors. When the surface of the skin is smooth, it is called glabrous; when roughened, with warty projections, verrucous; and papillomatous when the papillæ are much hypertrophied.

Diagnosis is easy. The hypertrophy and swelling of lupus are always accompanied by ulceration. The papillomatous vegetations are situated directly on the skin. In fibromata and myxomata which become pedunculated the tumors are isolated and circumscribed, while elephantiasis is diffuse. The cause of the condition is unknown, although it has been attributed to syphilis. It is due to an acute lymphangitis, with intense fever. The only effectual treatment is ablation and the suturing of the surface in order to secure union by first intention.

498. Fibroma and myxoma are tumors which are found in the large labia, though they may also develop in the nymphæ or in the perineum. They are benign tumors of slow growth,

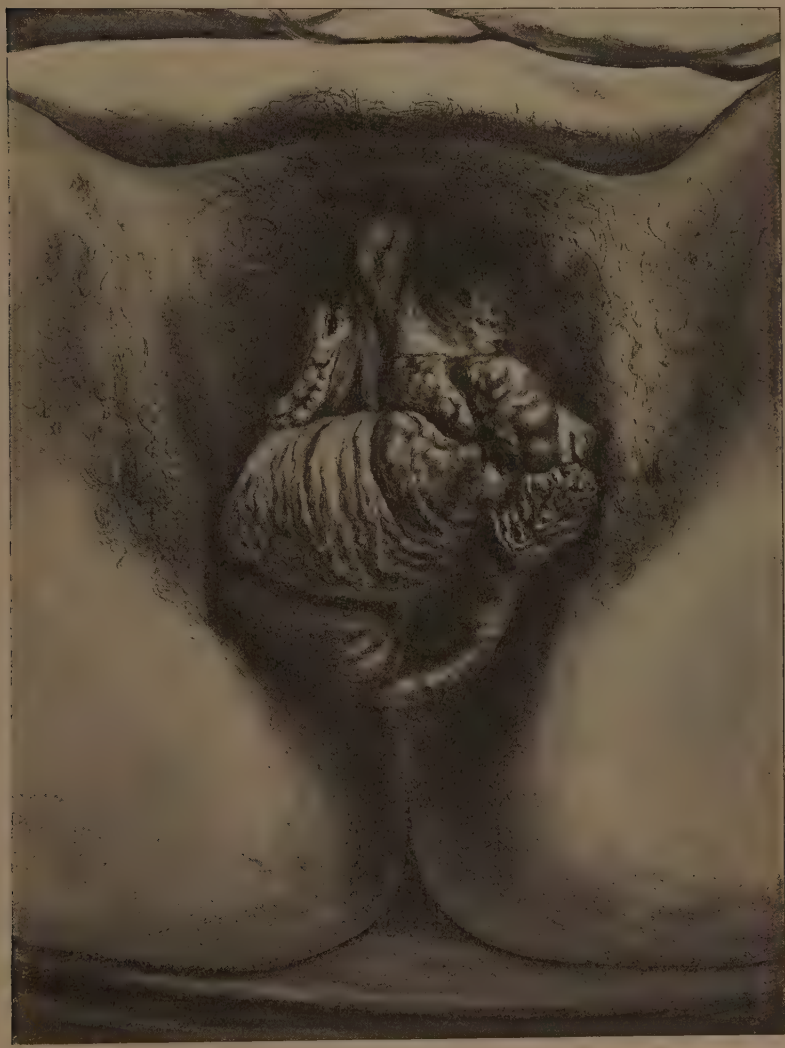


Fig. 437.—Elephantiasis of the Vulva.

though they occasionally attain to large size. The latter become pedunculated. The tumor may be enucleated or the pedicle may be cut without danger of hemorrhage. Figure

438 shows a fibroid tumor that occurred in the practice of Dr. S. E. Cox, of Nashville, to whom I am indebted for the illustration.

499. Lipoma.—A lipoma is a fatty tumor of the labium which may resemble elephantiasis. Lipomata are usually small, but Stiegel removed one that weighed ten pounds.

500. An enchondroma is an exceedingly rare cartilaginous tumor which affects the clitoris. It may become as large as the fist and present calcified portions. Bartholin reports a Venice courtesan who wounded her paramour with her ossified clitoris.

501. Malignant Disease of the Vulva.—Malignant disease occurs in the vulva in the form of epithelioma, sarcoma, and rarely as adenocarcinoma. Primary cancer of the vulva is rare. Epithelioma is the most frequent form and begins in the large labium or in the cleft between it and the lesser labium, less frequently in the clitoris or the meatus. The disease originates from the squamous epithelium and usually appears first as small warty nodules covered with thick layers of epithelium. Sometimes it follows irritation about the base of a pre-existing papilloma or wart. It is frequently preceded by psoriasis. The epithelium covering the nodules undergoes degenerative changes and causes a discharge of thin watery fluid mixed with blood. Groups of the embryonic cells fracture the limiting membrane and penetrate deeper tissues, supplanting the normal tissue and forming the characteristic epithelial pearls. Sometimes the cells will be found in the act of penetrating the walls of the blood-vessels, thus expediting the propagation of the disease. As the infiltration advances, superficial ulcerations occur, which gradually become deeper and involve the neighboring structures (Fig. 439). The inguinal glands are first sympathetically involved and later become infiltrated with the malignant cells. The disease occurs upon one side and then spreads to the opposite, possibly by inoculation through apposition. Adenocarcinoma results when the disease begins in the glands of Bartholin.

Fig. 438.—Fibroid of Labium.

Sarcoma occurs in the simple form as the melanosarcoma.

Symptoms.—The patient suffers from intense pruritus, in

scratching for which the nodules, previously unnoticed, are discovered. These become excoriated and cause a bloody discharge and an exceedingly fetid odor; not infrequently the nodule resembles a wart which has become irritated at its base, and subsequently infiltrated. The nodules may be sessile or pedunculated, and subsequently coalesce. When the disease occurs about the urethra, the orifice may become contracted, and the canal may appear as a hard, indurated cylinder. The

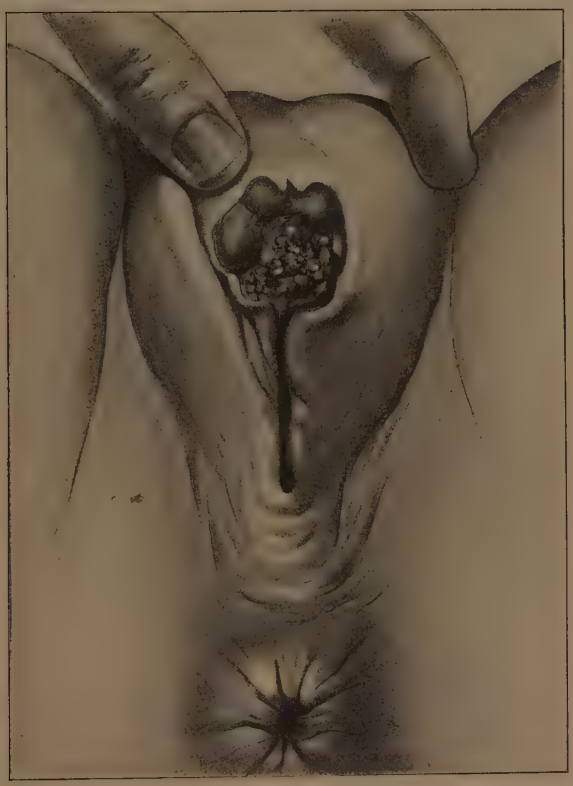


Fig. 439.—Cancer of the Vulva.

ulceration presents excavated borders, with the adjacent skin infiltrated and hard, and the pubic hair may fall out. In the later stages the skin and tissues for some distance around the vulva become indurated and hard, and the glands of the groin are infected. With the extensive inflammation, the discharge, loss of blood, loss of rest, and the mental anxiety produce emaciation, and death follows from marasmus, sepsis, or metastatic

development. The latent period is a long one, the disease remaining for some length of time with but slight circumjacent or more extensive involvement. Death occurs in the second or third year.

Diagnosis.—The history of continued genital psoriasis; intense pruritus, with small nodules; arrangement of the epithelial layer, which breaks down; the irregular ulceration, with infiltrated base and margins; and, later, glandular involvement,

Fig. 440.—Appearance of the Vulva after an Operation for Cancer of the Vulva.

are sufficient to indicate the character. Papillary vegetations extend over a considerable surface, are comparatively free from induration, and in no sense resemble cancer. A polyp or caruncle of the urethra has a base free from induration. Chancre is an indurated sore without disposition to spread, and is associated with glandular involvement, and later with the syphilitic eruption. Chancroid is a superficial ulceration without

induration. The adjoining surfaces readily become inoculated. The lymphatic glands promptly go on to suppuration and to the formation of buboes. In lupus the ulceration is serpiginous, with a tendency to cicatrization in the tissues first affected. Glandular involvement is rare.

The prognosis of malignant disease of the vulva is bad. The cases usually come under observation after extensive involvement, generally after the lymphatic system is involved in the malignant process. Operative treatment delays the progress of disease and renders the patient more comfortable.

Treatment.—The only hope for the patient consists in total removal of the disease. Some prefer the thermocautery or galvanocautery to the knife, as affording less danger from secondary inoculation. The scissors or the knife, however, are preferable, as by their use we shorten the convalescence and leave the structures less distorted. Care must be exercised, when possible, not to injure the meatus. In peri-urethral cancer, however, the sound should be introduced into the bladder, which will aid in the dissection, and the neoplasm, if necessary, should be followed to the neck of the bladder. In one case I removed the urethra up to the neck of the bladder without the patient suffering any incontinence. The incision should extend well around the disease, as far as possible invading healthy tissues. Bleeding vessels, rather frequent in this region, are secured with clamp forceps, and ligated if necessary with catgut suture, or the sutures closing the wound are so introduced as to constrict the bleeding vessels. Care must be exercised that the bleeding vessel does not retract and continue to bleed. The retraction thus of branches of the internal pudic caused hemorrhage which followed the pelvic muscles backward, broke through and formed a large hematoma upon the posterior surface of the sacrum, in one of my early operations for this condition. In such a case, if the vessel can not otherwise be secured, it will be better to tie the internal pudic over the external surface of the spine of the ischium. Fig. 436 illustrates the case of a woman who underwent operation in which both labia and clitoris were removed, and the tissue subsequently united, as seen in Fig. 437. Any inguinal glands involved should be extirpated, as well as the principal chain of lymphatic vessels leading to them. The circumjacent fat and cellular tissue should also be removed. When the disease has progressed too far to render radical operation successful, the putrid discharge may be temporarily controlled by the use of the curet and cautery. When the disease is too far advanced for this, the surfaces may be kept sprinkled with iodoform and

pure charcoal, and dressed with gauze. The surface can be dusted with the following powder:

℞. Salicylic acid, ... gr. iv
Boric acid, ... ʒ j
Iodoform, ... ʒ ij
Essence of eucalyptus, ... q. s.

Kraske advises in extensive disease that the parts be thoroughly curetted, the lacerated parts cleansed, and the surface covered with flaps of healthy skin, as this procedure renders the course of the disease slower and the symptoms less painful.

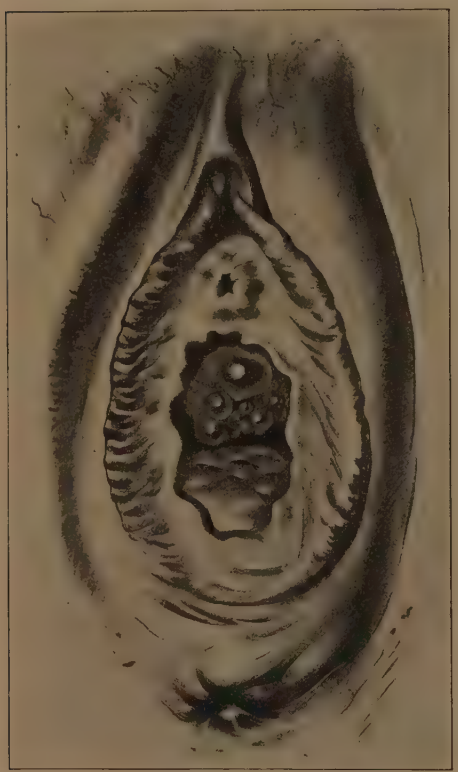


Fig. 441.—Cysts of the Vagina.

VAGINA.

Tumors originating in the structure of the vagina are infrequent.

502. Cysts of the vagina are very rare. (Fig. 441.) They are found as isolated tumors in the mucous and submucous membrane, in the former usually directly beneath the squamous epithelium. Rarely more than two or three occur in any individual case; Schröder, however, removed six from one patient. They are more frequently found upon the anterior wall, and are exceedingly rare upon the posterior. They vary in size from that of a pea to a hen's egg. The contents of these cysts are serous, more or less viscid or gummy, and are sometimes found mixed with blood. The epithelial lining of the sac may be either cylindric or laminated. The epithelium of some is ciliated (Abel). The origin of these growths is exceedingly difficult to determine. They have been attributed to the remains of Müller's, Wolff's, and Gärtner's ducts, to vaginal glands, or, according to Klebs, to dilated lymphatics. Neugebauer attributes most of them to remains of Gärtner's canal. Hematoma of the vagina may serve

as the origin for a cyst. Glands of the urethra may form retention cysts, and, as they develop, may project into the vagina.

The *symptoms* will depend upon the size of the cysts. Ordinarily, they produce no inconvenience nor discomfort. Recently a patient underwent examination for some pelvic disorder, when a cyst the size of a walnut was found upon the posterior wall.

Diagnosis.—The condition may sometimes be mistaken for cystocele or urethrocele. The use of the catheter during the examination will demonstrate the thickness of the septum and the presence and size of the cyst. In the upper part of the vagina cysts are confounded with small tumors in Douglas' culdesac, such as prolapsed ovaries, a noncystic inflammatory condition of the tubes, and other inflammatory collections. A second vagina, which is closed and filled with retained secretion, may simulate a cyst.

Treatment.—Only the large cysts require any treatment. The cyst may be opened and the sac cauterized most effectually with the actual cautery; or it may be packed with iodoform gauze, which affords drainage and sets up sufficient inflammation to obliterate the sac; or the entire sac may be enucleated.

503. Fibroid Tumors and Polypi.—Fibroid tumors originating in the vagina are very rare. They develop in the submucous or deeper layers of the mucosa and push into the vagina. As they increase in size they become polypoid, and hang by a pedicle. The structure is similar to that of uterine fibroids, and the growth is slow. The most common situation is the superior portion of the anterior wall. They are often adherent to the urethra, and distend the vulva. They are usually small, although they have been reported as weighing two and one-half pounds. Bandier and Gremlier report one weighing ten pounds. I am indebted to Dr. John C. DaCosta for the illustration (Fig. 442) of a specimen which he removed from the vagina. As these growths increase in size, they become softened and ulcerate. They are much more likely to develop during the period of sexual activity, although Tratz reported one in a child of fifteen months which attained the size of a man's fist, and Martin one $\frac{3}{4}$ of an inch long in a child two days old.

Symptoms.—The symptoms of the growth are largely dependent upon its size. If small, the tumor may remain unrecognized. Larger growths cause dysuria and retention of urine. They project from the vulva, and the traction produces bleeding, ulceration, and erosion.

Diagnosis.—The growths are readily determined by the situation, slow growth, and mechanical disturbance. The

softening, ulceration, and hemorrhage may sometimes lead to a diagnosis of malignant disease.

Treatment.—The treatment consists in the removal of the growth by enucleation in sessile tumors, and by section of the pedicle in polypus. Hemorrhage is controlled by suture.

504. Papillomata.—Papillary or warty growths are found in the vagina, generally in association with similar growths about the vulva. Generally they appear as small isolated projections over the walls, but occasionally the entire vagina will be filled.

Fig. 442.—Myoma of the Anterior Vaginal Wall.—(*Dr. John C. DaCosta.*)

505. Malignant Neoplasms.—In the vagina malignant growths of primary origin are very rare. They most frequently extend from the uterus, rectum, vulva, urethra, or bladder, in one of three forms: first, papillary; second, infiltrated or nodular, both of which are included histologically under epithelioma; third, sarcoma, either diffuse or circumscribed. They most frequently occur in the papillary form, although we may have carcinomatous infiltration, either circumscribed, forming a broad-based excrescence, or a substitution of scirrhous for the normal tissue.

Etiology.—Malignant disease is most frequent during middle age, and is rare in youth, although I have seen one case of cancer of the vagina in a woman twenty years of age. Hegar once saw it in a woman in whom it was attributed to the irritation produced by a pessary. Epithelioma of the papillary form usually affects the posterior wall, as a broad-based excrescence which rapidly invades the culdesac and extends downward toward the vulva. Epithelioma of the nodular or infiltrated form appears as nodules, which become confluent, sometimes localized about the wall of the urethra. The ulceration advances rapidly, and may burrow into neighboring organs, producing rectovaginal or vesicovaginal

fistula. The disease extends by the lymphatics to the pelvic cellular tissue; when it is situated in the anterior wall, the lymphatic glands of the groin are also involved.

Symptoms.—Vaginal epithelioma very early causes hemorrhage, which will be aggravated by locomotion, coition, and the various procedures in examination. There is a profuse purulent discharge which is exceedingly offensive; pain is not so marked as in disease of the uterus, unless in the later stages. The principal symptoms are the mechanical obstruction to coition and to delivery from stenosis, and the watery, bloody, and offensive purulent discharge. In a case recently under observation the disease had involved the anterior wall of the vagina, having apparently originated in the urethra, and formed a large scirrhus-like mass extending upward over one-half the anterior vaginal wall. The patient suffered from great inconvenience in urination, having frequent attacks of retention, and severe pain.

Fig. 443.—Primary Cancer of the Vagina.

Sarcoma. — Sarcoma occurs in two varieties: first, the diffuse sarcoma of the mucous membrane, often seen in young children; second, fibrosarcomatous growths, or melanotic sarcoma. Epithelioma, or cancer, may be distinguished from sarcoma by the use of the microscope. In the former, we note the characteristic assemblage of the epithelial cells, forming the pearly bodies, and preservation of the walls of the blood-vessels; while in the latter, the cells are more or less unconfined by

connective-tissue stroma and the blood-vessels appear as mere sluiceways or blood-channels.

Treatment.—The thin wall of the vagina is very slightly resistant to the progress of malignant disorder, and the disease is rapidly carried by the lymphatic vessels to the deeper cellular tissue of the pelvis, so that by the time the patient affected with cancer or sarcoma comes under observation, very little can be done in the way of treatment beyond relieving her from the discomfort produced by the accompanying symptoms. Complete recovery is rare. Eiselsberg, in a case of cancer which involved the whole of the rectovaginal septum, resected the coccyx and established an artificial anus in the sacral region after extirpating the whole of the diseased part. The patient rapidly recovered, and had control of her stools. In a patient of mine, when the disease had proceeded from the rectum, involved the posterior wall of the vagina and the perineum, and extended close to the cervix, I removed the coccyx, resected the sacrum, excised six inches of the rectum, removed the ovaries, tubes, entire posterior wall of the vagina, and the posterior commissure of the perineum. The rectum was stitched to the sacrum posteriorly, and to the anterior wall of the vagina anteriorly, the peritoneum having been previously closed. (See Fig. 498.) A colostomy had been performed upon the patient before she came under my observation. After the patient had recovered from the pelvic operation the opening in the intestine was dissected out and the two ends of the bowel were reunited. The patient was under observation for nearly thirteen months. The contraction of the intestine at the site of the former colostomy was sufficient to give the patient warning of the passage over it of feces, so that she could prepare herself for the evacuation of her bowels and avoid soiling her clothing.

506. Tumors of the Bladder.—Benign new growths of the bladder are claimed to be very rare in the female; the most frequent are the villous polypi, called by Rokitansky villous cancer. Albarran declared that every tumor of the bladder was malignant. The frequent deaths from uncontrollable hemorrhage and relapse would seem to justify such a diagnosis, but after careful microscopic investigation of the anatomic structure of the tumor by Virchow, he asserted that it was not correct, and called the tumor fibropapilloma, or villous polypus. The growth is most frequently situated on the lower surface or over the trigonum, though occasionally found upon the fundus and in vesical diverticula. It is sometimes completely pedunculated, so that several berry-like masses are situated upon a single stem, which is easily torn. In women these tumors

are more frequently pedunculated, while in men they have a broad base or present as multiple tumors. With water in the bladder they float about like a water plant. Sometimes there are several masses of various dimensions, like grapes or raspberries, upon a single pedicle. The tumors grow very slowly. These growths absorb water, and consequently become very much shriveled when kept in alcohol. Microscopically, they consist of a thick portion, which ends in villi of thin connective-tissue frame and many large vessels. Vessels are often so well developed that they completely supplant the frame. The epithelium is then situated almost completely upon the vessels. In other cases the connective-tissue frame is thicker, so that one would incline to pronounce it a fibro-papilloma. The under layers of the epithelium are cylindric in form, while the superficial are polygonal and the epithelium sends in no processes. We do not find nests or alveoli in the connective tissue, so the characteristic structure of cancer is wanting. The base of the bladder-wall is thickened and infiltrated, a centimeter in thickness, which forms a crust distinctly recognizable during operation. The tumor itself is firm or soft, according to the thickness of its stroma. The pedicle is frequently so soft that, in an operation, an attempt to tie it results in the thread cutting through or tearing it off. The large blood-vessels contained in the connective-tissue frame lead to engorgement, and not infrequently to strong venous hemorrhage. This is the principal symptom of the villous polypi. These polypoid multiple tumors may fill the entire bladder. They may even pass through the urethra to the external orifice.

507. Mucous Polypi.—In cystitis not only enlarged papillæ, but also mucous polypi, are observed. These growths have a smooth surface without papillomatous arrangement, and are poorly supplied with blood-vessels. Occasionally, they attain considerable size—from five to seven centimeters in diameter.

508. Myoma.—A myomatous tumor of the female bladder is much more rare than in man. The tumors are hard, whitish upon the cut surface, arise from the vesical muscular structure, and grow into the wall or become pedunculated. With the gradual thinning of the pedicle, the tumor loses vitality and becomes partly destroyed.

Cystic or softened myomata are also recognized.

Dermoid of the bladder has been observed (Thompson).

Symptoms.—The most characteristic symptom is hemorrhage. The bleeding is very likely to occur in the night, perhaps owing to congestion from being warmly covered in bed. Bleeding takes place without any other symptom, and must

be carefully investigated, as the patient will frequently assert that it comes from the vagina. The hemorrhage may suddenly cease, and the urine the following day be perfectly clear, to continue so for a number of weeks, when bleeding again recurs. After the tumor exists for some time, bleeding will become continuous.

Pain may be absent for years.

Cystitis does not necessarily exist. Indeed, small tumors may have no influence upon the mucous membrane; floating in the urine, they do not injure its epithelial surface. In spite of long-existing growths, we will find the bladder surface pale from the general anemia.

When hemorrhage leads to the suspicion of the existence of vesical tumors, the use of the catheter must be practised with care. The touch of the instrument causes injury; portions of villous growths float into the eye of the catheter and are torn off. Such masses should be carefully examined. Tumors of the trigonum float into the internal urethral orifice and obstruct the flow of urine. In long-existing tumors the urine becomes progressively bloody, coffee-like, or brownish. The surface of the tumor, from which the blood arises, appears black, red, sometimes opaque, or a bright red. The continuous vesical hemorrhage leads to intense anemia, although it is surprising how long the patient will endure it. Gradual emaciation, and finally cachexia, appear. The disease may extend over a period of many years.

Diagnosis.—Examination is practised by palpation with two fingers of one hand in the vagina, while the fingers of the other are placed over the abdomen. The patient lies upon a table or hard couch. If the bladder is emptied with a catheter, one must remember its danger. The examination is made slowly, carefully, and systematically. Generally, the abdominal walls are easily depressed. When the patient is unable to relax them, an anesthetic should be given. By careful investigation a tumor as small as a hazel-nut can be recognized, but pedunculated growths may easily be displaced to one side and elude the grasp, and leave one in doubt as to their presence. The ovaries are not unusually so situated that they may be felt, and lead to the belief that a vesical tumor is present. The cystoscope aids in clearing up doubt. Diagnosis should not be based alone upon palpation. The urine should be examined chemically and microscopically. Cylinder-like cells are characteristic of papilloma. The older writers placed great stress upon the character of the hemorrhage—whether fluid blood, worm-like clots from the ureters, blood only, in the first or last portion of urine, or pure blood followed catheterization.

These distinctions afforded differential diagnosis between renal and vesical hemorrhage, but are now considered of little value as compared with cystoscopy. By direct investigation the relation of the tumor to the vesical wall is observed, and bloody urine can be seen flowing from the orifice of a ureter. The bladder can also be investigated by touch with a finger introduced through the urethra, but this should be practised with the greatest prudence, and, preferably, with the little finger only, because overdilatation may result in incontinence.

Treatment.—The one treatment for vesical tumors is operative. Following the diagnosis, the operative procedure should be employed as soon as the condition of the patient will permit. High fever, suppuration, cystitis, and marked anemia are considered as contraindications.

The removal of the growth is surprisingly easy. New loss of blood is endangered by every day's delay. Suppuration is not a contraindication. If the tumor is large, irrigation with the syringe does not secure disinfection, and suppuration ceases only after the complete removal of the mass, and thus the danger of nephritis is lessened.

The tumors may be reached through the urethra by the urethral speculum. The masses are seized with forceps and torn off, cut through by the galvanocaustic loop, cut away with scissors or forceps, or scraped off with a sharp curet. The latter instrument, however, should be used only when the finger can be introduced as a guide. Whatever method is employed should be thorough. In large, broad-based, friable tumors much injury may be done by scraping or tearing. The bladder soon fills with blood, which is hard to remove and decomposes, and the necrotic masses often cause cystitis and suppuration. Syringing the bladder with ice-water and astringents is painful.

If the pain, loss of blood, and cystitis are aggravated by the operation, it is hard to convince the patient that anything has been done for her relief. In extensive involvement or growths with a broad base the preliminary incision of the bladder is more effective and satisfactory, as by it the diseased structure and the field of operation are exposed to view and to more effective manipulation.

Vaginal Incision.—As a guide a catheter is introduced into the bladder, upon which a longitudinal incision is made through the middle line of the vagina, about five centimeters long, of sufficient length to permit the introduction of two fingers. The incision can be enlarged with scissors or with a knife above and below, affording considerable exposure of the bladder and its morbid growths.

Bleeding vessels are secured by pressure forceps. The growths are then removed with forceps, scissors, knife, fingers, the galvanic loop, or the Paquelin cautery. In copious hemorrhage syringe with either ice-water or quite hot water; cotton sponges wet with the latter may be pressed upon the bleeding surface. Sutures can not well be used, because they cut through. The precaution must be exercised to avoid injuring the ureters. Hemorrhage is very severe in these operations and greatly obscures the view. The fistula should be closed, a catheter introduced, and the vagina tamponed to compress the bladder and decrease the bleeding. An ice-bag should be applied over the lower abdomen.

The trifling mobility of the bladder in the region of the trigone renders it difficult to expose a bleeding vessel through the vaginal incision, and the bleeding renders the field but little more accessible to view than through the dilated urethra, while through the latter the organ can be tamponed even more effectively than by the vaginal incision.

Abdominal Incision.—The sovereign procedure is the high bladder incision. A transverse incision gives more room than a vertical, though the two may be combined in a T-shaped cut. The difficulty in securing firm union and prevention of ventral hernia subsequently, however, precludes its practice. The vertical incision requires strong traction to be made on each side. Fritsch prefers the transverse incision, claiming that recovery is excellent if the incision is not made too long—not over six or seven centimeters. The scar so disappears under the hair of the mons veneris that subsequently it is no more seen, even if the wound heals by secondary intention. It has the additional advantage that large vessels are not likely to be cut. He has seen a number of cases in which extensive hernia had formed above the symphysis, but these were cases in which the object of the operation had been castration, suprapubic transverse section had been employed in the operation for castration, or cases in which the Trendelenburg posture had been employed for operations upon bladder fistula. In all these cases the scar tissue could still be seen. In twelve of these cases the incision had been twelve or more centimeters long. Such an extensive incision is unnecessary in bladder operations. If the incision is made shorter, the recti recover, with a firm scar to the pubic bone.

Fritsch describes the procedure as follows: The patient is placed in the Trendelenburg posture, with pelvis elevated, and the mons veneris and vagina are thoroughly cleansed. The bladder must also be thoroughly irrigated; the vagina, for the reason that the fingers may be required to be intro-

duced into it, in order to penetrate the bladder from above. The bladder should be irrigated with several liters of boric acid solution. It is better to employ a large quantity of water than a trifling quantity of disinfectant solution. If the urine is clear or the discharge of blood quite fresh, syringing is unwise, as it can easily cause a hemorrhage. An assistant places his hands upon the abdomen in such a way as to keep the movable skin fixed, while a transverse incision is made above the symphysis. The point at which the incision is to be made should be fixed before the skin is put upon the stretch; otherwise upon drawing it up it may be found that the incision is too low. It should be made directly over the upper border of the symphysis. While one is operating in the loose fatty tissue behind the symphysis, an assistant pushes up the bladder with a thick male catheter. The projection made by the end of the catheter is readily seen, the tissue above it is picked up with a tenaculum, and the bladder-wall is cut transversely above the end of the catheter. As soon as the bladder is opened the margin on either side is seized with a pair of pressure forceps and the bladder is prudently drawn down so that the forceps will not tear. The catheter is removed and the incision extended right and left by scissors until a broad wound is made in the vertex of the bladder, which will permit one conveniently to enter it with two fingers and inspect its inner wall. In this, as in all operations, it is important to proceed rapidly. The margin of the bladder is seized by ten or twelve pressure forceps, which hold the bladder open automatically and make its cavity visible. To sew the bladder to the margin of the wound would take more time. If the tumors are large and deeply situated, they may be discovered to the right or left by two fingers. The pedicle is seized between the fingers and the tumor prudently drawn up. As the structure tears easily, the bleeding point may sink back and vanish from view; when the bleeding is copious, one may be in doubt just what shall be done. It can be controlled promptly only through tamponade, which takes time; consequently, it is important, if possible, not to tear the tumor.

Having fixed the situation of the tumor, one must make accessible the pedicle. This not infrequently may require an enlargement of the skin and bladder section. To avoid this, an assistant seeks to enter the vagina, and presses upward in the region of the pedicle. Hemorrhage may be controlled by a Paquelin thermocautery. The smallest points should be employed, in order to avoid extensive burning of the epithelium of the bladder. The ideal procedure is the employment of the galvanocautery. In small polypi and

very small tumors the galvanocaustic loop does not act so well. To tie them off, is, of course, difficult, as the thread easily cuts through. Frequently the base can not be encircled, on account of the proximity of the ureters. If we pass a ligature deeply in the firm tissue, we may injure or occlude the ureter. A hot iron is not effective in arresting the bleeding, and yet this must be controlled in order to proceed. More favorable action is accomplished by long and continued direct compression of the wound from the vagina and bladder. A strong vaginal tampon has a good influence. Ice-water may be used with advantage, and influences the closed bladder still better. In the open bladder the influence is not direct on the bleeding vessels, as the bladder muscle, like that of the uterus or the placental part, contracts on the bleeding surfaces. When the pedicle is quite visible, so that with the Paquelin one can touch the proper place, we should employ the scissors to cut the growth away. The smooth, well-marked, cut surface can be compressed by the finger of the assistant, in the vagina, with a certain advantage. It may be necessary to tamponade both vagina and bladder and to apply a firm abdominal bandage. This method is effective in controlling hemorrhage.

The means by which hemorrhage is to be controlled must be rapidly determined upon, whether it be the Paquelin, the application of a solution of iron, syringing with ice-water, or surrounding with needle clamp forceps. The tampon should be prepared beforehand, and should be ready. In large, broad-based, villous growths we should work with sharp curet and scissors. Hemorrhage is often quite considerable. If the tumor is situated in the trigonum, so that there is no danger of injury of the ureter, the base of the bladder-wall can be penetrated and ligated. The possible discharge of urine through stitch-holes is of no significance, for in Shucking's operation for uterine fixation it is probable that the needle has frequently entered the peritoneal cavity, and it is only in rare cases that peritonitis appears. The necessity of preventing hemorrhage by a tampon after the operation excludes the possibility of complete suturing of the wound. We can, of course, draw together the bladder wound somewhat, as well as diminish that in the skin by lateral sutures, but in the middle it must be kept open for the eventual renewal of the tampon. In such cases it should be the rule to sew the bladder to the skin wound, in order to make its cavity accessible and to secure the tissue behind the bladder from overlying urine and wound secretion. As the patient recovers, the bladder suture cuts through, the organ sinks back, and the wound opening is gradually closed by granulations. When the opening continues too

long, it should be narrowed by suture after artificial freshening of the wound. A permanent catheter should be introduced, which is necessary in all bladder injuries. With an incision into the bladder vertex, or in bladder resection, do not completely close the bladder wound, but place a strip of iodoform gauze in the opening left in the wound. It has repeatedly occurred that the patient accidentally or purposely has had the catheter removed, when the urine can flow from the wound without injury; but if the wound is entirely closed, the removal of the catheter would work injury to the processes of recovery. After the bladder tampon is removed hemorrhage rarely occurs. Bloody urine disappears in from twenty-four to thirty-six hours after the removal of the tampon. While the catheter remains, the bladder should be irrigated with astringents or a weak solution of liquor alumini acetici. This direction applies also to the external wound, and the pledget should be wet with the same solution. The upper wound has a great tendency to close. If the granulations are weak, as in anemic patients, they can be stimulated by dilute alcohol, camphor, silver salts, or tincture of iodin. The appetite, which is lost through an excessive flow of blood from the tumor, improves, and the patient gains rapidly in weight. The patient should be permitted to rise from bed as soon as the wound is healed. When the operation is very late in the progress of the disease, the wound remains unaltered, the patient does not recover from the anemia, and does not regain her appetite. Whether the patient dies from loss of blood, from loss of strength, or by the influence of the operation, is difficult to determine.

509. Carcinoma.—Klebs asserted that cancer of the bladder always began in the prostate. Had this assertion been correct, woman should be exempt from the disease. Primary cancer of the bladder has been described by a number of investigators. Bode alone has seen fourteen cases. Cancer appears as a hardening and thickening of the bladder-wall, which is covered with several layers of epithelium. Small tumors form in the periphery, sometimes as isolated masses, while complete infiltration of the entire bladder is very rare. Following the destruction of the epithelium, destructive ulceration of the cancer occurs. This takes on a malignant character if putrid germs appear in the bladder.

Symptoms.—The urine smells like carrion; there is pain and vesical tenesmus. By rapid increase the carcinoma breaks through externally. High fever appears. The bladder with rapid growth of carcinoma is fixed in contraction in the paravesical tissue. With the peritonitic irritation there is increased sensibility. The disease extends up to the ureters, and develops

pyelitis on both sides, interstitial abscesses, or nephritis. If death has not already taken place, it occurs from high fever and profound cachexia. It is found that the ureters become dilated as a result of the pressure upon those portions situated within the bladder-wall.

Uterine cancer simulates the symptoms of villous tumors. If infiltration of the bladder-wall takes place, symptoms of cystitis appear. It is sometimes asserted that after extirpation of villous tumors carcinoma occurs in their place, but pathology does not seem to sustain this argument. The existence of malignant disease does not contraindicate operation, though it is necessary, in order to remove the matrix of the tumor, that a portion of the bladder-wall should be removed in order to operate in healthy tissue. In the adoption of this principle a portion of the bladder-wall, the trigonum, must be omitted. To remove it, we must remove the ureters, or at least the place at which they enter the bladder. Bardenheuer, in a case of extensive disease of the bladder, through an abdominal incision upon it, shoved back the peritoneum, loosened the bladder as far as possible from the perivascular tissue, raised it up, incised it longitudinally, secured it with sutures, and drew it into the abdominal wound. The now exactly determined tumor is, with an elliptic piece of the bladder-wall, excised, and the wound margins are united by continuous suture, sparing the mucous membrane. Finally, the belly wall is sutured and a continuous catheter introduced. Wassiljew reports a case of total extirpation of the bladder for malignant tumor. The ureters were secured outside the bladder and sutured in the belly wall. The patient recovered, although both ureters became necrotic, in two centimeters of their course; but the pyelonephritis improved, as well as the general condition. Bensa describes a case in which a greater portion of the bladder was extirpated on account of an infiltrated carcinoma of the right bladder-wall in a woman fifty-one years old. The operation was accomplished by a median incision in the mons veneris; the symphysis pubis was separated and the bladder opened and loosened subperitoneally, except on the right side, where the peritoneum tore, but was immediately sutured again, then loosened on the left side; the left ureter was resected, and the under part of the right ureter, because it had been invaded by carcinoma. The ureters were replaced in the small remains of the bladder, which was closed by sutures. The symphysis was then closed with silver wire sutures and the wound tamponed above and below the symphysis. The patient died the day after the operation. Bensa holds total bladder extirpation as indicated, first, in benign tumors if

they are multiple and produce sufficient disturbance of the bladder function; second, in infiltrated malignant tumors if they occupy the greater part of the bladder-wall; third, in large, broad-based tumors of the base of the bladder. The entire bladder has also been resected for tuberculosis. How much advantage is to be obtained from these procedures is a question. Narrowing of the ureters in the artificial bladder and small abscesses from implantation and sutures cause disturbance for months, even though the case has been quoted in literature as a successful result. After extirpation of the bladder the ureters have been implanted in the vagina. While the vagina is normally aseptic, it is questionable how long it will so remain with this additional abnormal function.

UTERUS.

510. Fibromyomatous Tumors.—Myofibromata are benign growths which occur in the cervix as well as in the body of the uterus. Their structure consists of connective tissue, or of muscular combined with connective tissue. The former are indicated by the term fibroma; the latter as myoma or fibromyoma. The pure myomata consist only of muscular structure and exist only in the early stages. They usually appear singly and may attain rather a large size.

The myomata are the most frequent form of uterine growths. Careful examination will disclose such a growth in 20 per cent. of all the women who have reached the age of thirty-five years (Bayle), in 40 per cent. of women of fifty years (Klob), but the great majority are small. The growth of the tumor is very slow; when rapid increase in volume is observed, it arises, not from an increase of tumor elements, but from a disturbed condition of tissue fluid, which will be considered later. The most favorable condition for rapid growth is an intimate vessel union with the uterus.

It is the generally accepted view that fibroid growths increase in size only during the period of sexual activity, and remain stationary or undergo atrophy after the climacteric. It is quite probable that no myoma ever originates in the uterus prior to puberty or subsequent to the menopause. A tumor has been reported as having been found in the uterus of a girl aged ten years, but no opportunity was afforded to demonstrate the correctness of the diagnosis by microscopic investigation.

Sutton has reported a childless widow, who had never menstruated, as having carried such a tumor for ten years. Peter Muller and Joseph Taber Johnson both assert that the growth

sometimes continues to increase after the cessation of menstruation. Hoffmeier says that such increase occurs in those myomata which stand in nutritive union with the peritoneum through organized bands of adhesion. The truth of this is especially indicated in omental adhesions, which greatly influence the progress of the growth. He cites a woman in whom a thirty-five pound myoma, with numerous interstitial and omental adhesions, had continued to grow for a year after the menopause.

A myoma is rarely found alone in the uterus. The disease generally exists as a multiple tumor formation. Over fifty growths have been found in one uterus. J. Bland Sutton recently removed a uterus which contained one hundred and twenty myomatous growths, varying in size from a pea to an egg. They vary from a tumor the size of a pea to an enormous growth. Hunter removed, after death, a tumor that weighed 145 pounds, while the woman weighed but 95 pounds.

How much the growth of myomata is influenced by the activity of the sexual organs remains difficult to determine, but the fact that myomata originate and have their greatest growth during the years most favorable for procreation can not be without significance. Myomata occur with about equal frequency in the married and unmarried. Observation does not justify us in the assertion that the size to which they attain or the rapidity of their growth is influenced by the married or the single state. Some regard sterility as a cause of myomata, others as a consequence.

Winckel and Schröder consider that the following conclusions are justified:

1. Fibroid growths originate without relation to marriage or to pregnancy.
2. Sexual excitement favors growth.
3. The presence of a growth inclines to prevent child-bearing.
4. Pregnancy promotes growth.

511. Pathologic Anatomy.—Whatever the origin, they are found in either the body or the cervix of the uterus, but in larger proportion in the former situation, and more frequently in its posterior wall.

The consistence of the growth varies with its structure. A soft muscular mass presents, upon section, a reddish-pink color, with wavy, glistening bands running in every direction, but with a tendency to form whorls about individual centers, owing to the origin of the disorder along the course of blood-vessels. The cut surface of a fresh section presents an uneven appearance, owing to the elasticity of the fibrous tissue, causing the softer muscle surfaces to bulge. The mass is enveloped

by a false capsule, produced by compression changes in the uterine structure. The capsule varies in thickness according to the site of its development. If the growth has originated in the middle layer, the capsule is thick and well formed; but if immediately beneath the peritoneum or the mucous membrane, the capsule will be very thin or may even be absent.

About the tumor is a layer of loose connective tissue, which permits ready enucleation. Occasionally, there are numerous

Fig. 444.—Microscopic Section; Myoma Uteri.—(*Coplin.*)

fibrous bands to the capsule, which render enucleation difficult, and are so frequent as to appear like a hyperplasia.

The tumor is surrounded by numerous large vessels, from which it is nourished, but which do not penetrate its substance to any great depth.

The vascularity of the structure is slight as compared to that of the uterine wall, for well-formed vessels are rarely found away from the circumference. In the softer variety the blood-vessels are comparatively numerous; in the harder varieties they are very scant.

512. Microscopic Appearance.—The comparative amount of muscular and connective tissues varies widely. In young and rapidly growing tumors the muscular tissue predominates and the capsule or line of demarcation between growth and uterus is ill defined. As the tumor becomes older and more mature, there is a substitution of connective for muscular tissue, and it becomes hard and dense. (Fig. 444.) The section differs in appearance according to its direction. A longitudinal section presents cells of an elongated shape with rod-like nuclei, while a transverse section resembles groups of round cells. Occasionally, between the muscle bundles are spores—lymph-glands lined with endothelium. They develop from cellular proliferation about the capillaries, and, with increase of connective tissue, may grow to large size. (Fig. 445.)

Fig. 445.—Liomyoma of the Uterus. B. and L., $\frac{1}{6}$ in. obj.; 1 in. oc.

513. Varieties.—Bishop follows Gusserow's classification and divides myomata into the multiple and encapsulated and the single and nonencapsulated. The former are found most largely in the body of the uterus, while the latter grow from the cervix. This division is based upon structure. The multiple growths are hard and firm. They largely consist of fibrous tissue, apparently mature, and no longer continue to grow. They are also called fibromata. The single growth is soft and elastic. It is largely supplied with vessels and is rapid in growth. In its structures the muscular tissue will be found to predominate. They are known as liomyomata or fibromyomata. All myomata originate within the uterine wall, but upon their proximity to its inner or outer surface will depend their future progress. The most frequent classification, and that which we find most useful in practice, is a division of myomatous growths according to their situation into: (1) Submucous, intramural, or concentric (capsulated, noncapsulated); (2) interstitial, mural, or centric; (3) subperitoneal,

extramural, or excentric (capsulated and noncapsulated); and (4) fibromyomata of the cervix.

Degenerative changes which may occur in the life-history of such a growth are indicated by the terms: Edematous, Colloid or Myxomatous, Fibrocystic, Calcific, Necrobiotic, Necrotic; but these changes are not sufficiently constant to justify their employment to indicate a distinct classification.

The same statement can also be applied to the further

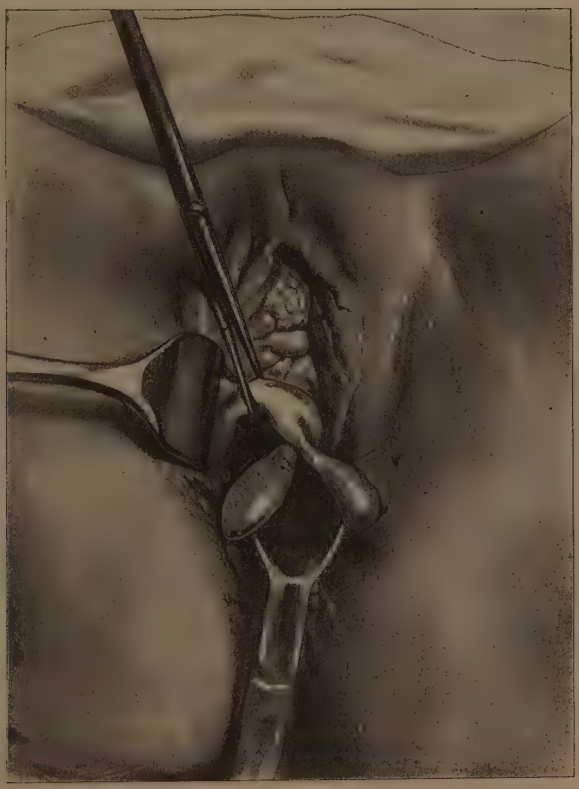


Fig. 446.—Submucous Myoma (Polypoid).

division which is sometimes given: Sarcomatous, Adenomyomatous, Telangiectatic, Lymphangiectatic.

514. Submucous fibroids, according to the proximity of their origin to the mucous surface, present two varieties—the encapsulated and the noncapsulated or free. The former develop in the wall and are extruded beneath the mucous membrane by the uterine contractions. The second variety, the

free, originate immediately beneath the internal surface, and are not supplied with a capsule, but are closely enveloped by the mucosa. An encapsulated tumor may become free through absorption or thinning of its capsule from pressure.

The encapsulated variety are much larger than the free. Nature regards such growths as foreign bodies and endeavors to extrude them from the uterine walls. Under this action a submucous fibroid may become pedunculated, when it is known as a submucous or fibroid polypus. (Fig. 446.) The

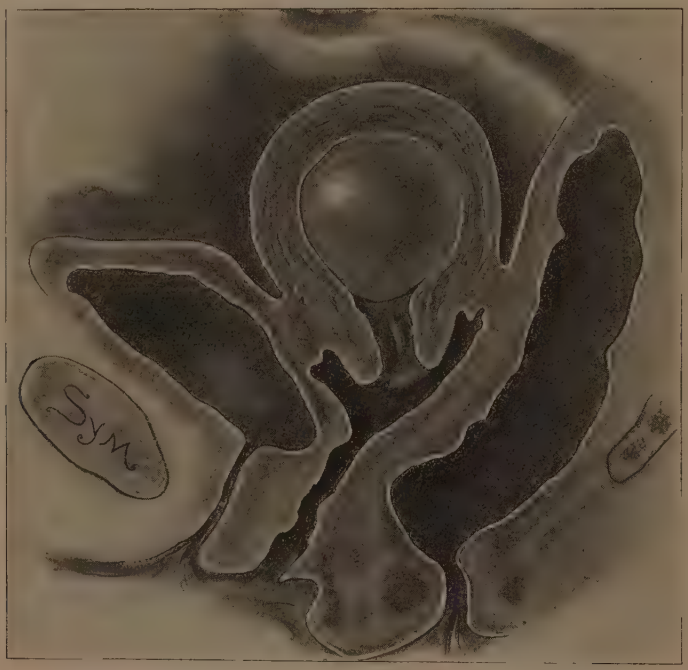


Fig. 447.—Sessile Submucous Myoma.

muscular capsule may resist expulsion and prevent pedunculation, while the tumor bulges into the uterine cavity from a more or less broad base, and is called a sessile submucous fibroid. (Fig. 447.)

The sessile and pedunculated submucous tumors enlarge the organ and increase its vascularity. (Fig. 448.) The repeated contractions, together with the expulsive efforts, lead to hypertrophy of the muscle-wall to such a degree as to simulate pregnancy. The circulation in the entire mucous mem-

brane, and especially in that portion covering the tumor, becomes obstructed, leading to severe hemorrhages.

The severe pressure frequently causes atrophy and ulceration in the free variety, and the production of grave secondary changes, such as sloughing and gangrene. Compression of the neck of a polypus may cause edema, and, when acute, can produce gangrene or sloughing of the mass, and a fatal termination. In the slower form the chronic edema may often be mistaken for a cyst. Uterine contraction may lead to elongation of the pedicle of a pedunculated fibroid and cause its extrusion from the external os into the vagina, where it can be readily recognized and removed. (Fig. 449.) The elongation of the

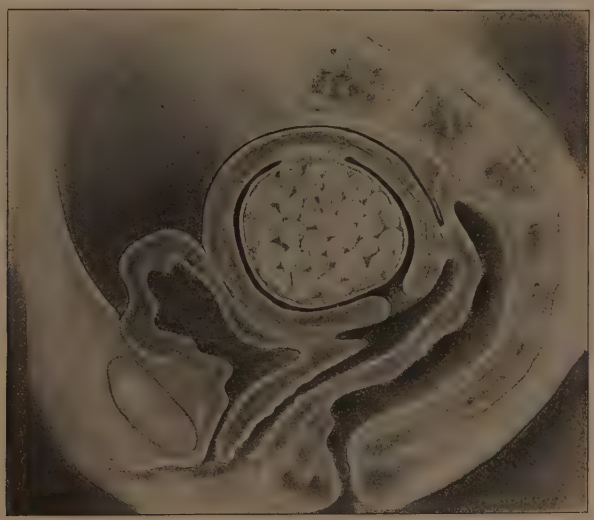


Fig. 448.—Submucous Myoma Occupying Uterine Cavity.

pedicle may become sufficient to permit the mass to hang from the vulva. The expulsion into the vagina may be sudden, but it generally occurs slowly. Very rapid expulsion of a tumor with a short pedicle may produce partial or complete inversion. Not infrequently the polypus may be felt projecting from the os during menstruation, while it disappears during the intervals; this condition is known as intermittent polypus.

Rarely by the efforts of the uterus the tumor may be completely and spontaneously separated and extruded.

The pressure of the uterine or vaginal wall upon the tumor sometimes causes ulceration, from which adhesions may form and by which the nutrition is maintained. A polypus may be

so firmly gripped by the cervix as to cut off its supply of nutrition and cause it to slough. The gangrene may spread upward and produce a fatal result. Such a condition can easily be mistaken for cancer.

515. Interstitial, mural, or **centric fibroid growths** develop in the parenchyma of the uterus, frequently attain to enormous size, and involve the entire structure of the uterus, when they are then known as the diffuse or the gigantic fibroid. (Fig. 450.) A second variety is the circumscribed general form (Fig. 451); the third, the local interstitial fibroid. (Fig. 452.) In the general circumscribed variety, as described by Schröder, the wall of the uterus may be filled by a large number of growths.

Fig. 449.—Submucous Myoma Extruded into the Vagina.

In the localized fibroma a single or two or three interstitial fibromata may be found. These growths are situated in the wall of the organ, surrounded by muscle-fibers and the loose connective-tissue capsule, from which they can be readily enucleated. In the diffuse form the entire structure of the uterus seems to be taken up by the growth, and it is difficult to fix a sharp border of limitation between the growth and the uterine wall. These growths, when they attain a large size, not infrequently draw out the lower portion of the uterus as a pedicle, which may be attenuated to the thickness of the finger, and twisted, as seen in one case by Küster, where, in

the twist, the torsion was two and one-half times. The cervical canal had been obliterated. Occasionally, the uterine body is found separated from the cervix. The muscular structure of the uterus itself undergoes hypertrophy in these cases, particularly when but few growths occupy the wall. The uterine wall becomes thickened, its cavity is increased, and the cavity undergoes various changes in its shape and size, according to the development of the tumor and its projection into it. (Fig. 453.) The influence of the growth upon the endometrium is most marked. In a large interstitial myoma it may become strongly distended, not infrequently thin and atrophied. In other cases there is a hypertrophy of the entire

Fig. 450.—Voluminous Myomata Occupying Anterior and Posterior Walls.

mucous membrane, occasionally only of the glands; in others, the interstitial tissue between them is increased. Occasionally, the condition is complicated by malignant edema. In the great majority of cases hypertrophy of the mucous membrane is found associated with these growths. Indeed, the endometrium may be three or four times its normal thickness.

516. Subperitoneal growths (also called subserous, excentric, or extramural) are generally spheric or ovoid masses springing from the external surface by a more or less distinctly marked pedicle. Like the submucous, these growths are sessile or

pedunculated. While the latter class are polypi, that term is more generally applied to intra-uterine growths.

The surface of the growth may be smooth or irregular, according to the contraction of the connective tissue. A division into free and encapsulated is made: the former covered by the serous layer, which is closely attached, without capsule, to the surface of the tumor; the latter, or encapsulated, are covered with a layer of muscle-wall beneath the peritoneum.

The free are hard and only attain a small size; the encapsulated are soft and often become enormous. The pedicle of the tumor varies in length and thickness. It may be short,

Fig. 451.—Circumscribed Interstitial Myomata.

thick, and permit but little movement between the tumor and the uterus, or long and attenuated, affording such marked freedom as to cause doubt whether the growth is connected with the uterus. The pedicle can sometimes become so twisted as to cut off the circulation of the tumor and lead to its loss of vitality, the development of gangrene, and subsequently to septicemia or peritonitis; or the tumor, in more fortunate cases, may become adherent to the surrounding viscera and lose its association with the uterus. Such a growth is nourished by its adhesions. Not infrequently a very movable tumor causes ascites, and thus simulates a malignant growth.

517. Fibromyoma of the Cervix.—Cervical myomata, like those of the uterine body, are submucous, interstitial, and subserous. These growths originate in the body of the organ, and, by the process of enucleation through contraction, may have been driven downward, either through the cervical canal or into its structure by splitting it externally or, as in the single noncapsulated tumor, had its origin in the cervix and grown either upward or downward. The latter may be either pedunculated or sessile, and rarely attain a size larger than a goose-egg, although they may completely fill the pelvis. (Fig. 455.) They cause contraction and prolapse of the uterus, and simu-

Fig. 452.—Local Interstitial Myomata.

late inversion of the organ. They may be divided into two classes:

(*A*) Those of the external os, in which the tumor is formed by a cylindric or elongated lip in the interstitial variety. (Fig. 456.) The submucous growths of the cervical canal are occasionally polypoid, which, like slender stalactites, descend through the cervix by the splitting process.

(*B*) Tumors from the subvaginal portion. These are more important when developed from the external surface and situated between the layers of the pelvic floor. They become intraligamentary and exceedingly dangerous by pressure upon the

ureter or upon the pelvic vessels; also when posteriorly they press upon the rectum and push the uterus forward and upward. Occasionally, the tumor crowds anteriorly against the bladder, between it and the uterus. Most generally these tumors are found surrounded by a loose capsule, which permits of ready enucleation. Sometimes, however, there is no line of demarcation between the tumor and the uterine structure.

518. Etiology.—These growths occur more frequently than any other to which women are subject. Not infrequently they may attain to considerable size without the patient being aware of their existence, and are then recognized only by ac-

Fig. 453.—Uterus Opened, showing Multiple Interstitial Myomata.

cident. The causes of their development are unknown. Recklinghausen attributed their origin to embryonic tissue, the remains of the Wolffian bodies. The irritation which characterizes fibromata is not a physiologic irritation like that of pregnancy, but a diseased impetus. It is an unusual kind of local irritation, associated with a weak or debilitated condition of the concerned spot. This introduces Cohnheim's view of tumor origin, which was that the local irritation was brought to development by the presence of tumor germs. The influence of sexual irritation is appreciated, in that statistics

demonstrate that in the majority of cases the first indications appear during the second half of the third decad: *i. e.*, between the twentieth and thirtieth years. The tumor forms in the first half of the fourth decad, shortly after the thirtieth year. These growths rarely develop before or after these periods, although Biegel is reported to have seen one in a girl ten years of age, and Leopold the beginning of a myoma in a child. There has been much discussion as to the influence of the married or single state upon the development of these growths. The investigations of Möller show that 32.8 per cent. occur in virgins, 67.2 per cent. in those who are not, but one-half of the latter are sterile. Hofmeier says that the number of births does not stand in any relation to the causal formation of the growth,

Fig. 454.—Subserous Myomata.

while Winckel believes that the married are more predisposed, and that the myomatous formation decreases the number of births. Shoemacher, on the contrary, asserted that the unmarried are more frequently so diseased. Hofmeier accounts for the relatively large number of unmarried women who suffer from myomata by the explanation that the tumor formation is one of the few causes which lead them to consult the gynecologist. Prochownik gives syphilitic infection as a cause, but the growths occur so frequently in individuals in whom there has been no possibility of such infection as to render this view of little value. Olshausen and Gusserow assigned local irritation as the etiologic factor. Shoemacher also looks

upon menstrual congestion as a cause, but to give these reasons for the development of the disease is equivalent to giving none, as it is necessary to seek further for the cause of the irritation. Möller, already referred to, frequently found that a myoma the size of a pin's head was separated from the uterine muscle by a distinct layer of connective tissue. Small arteries could be traced into the growths, which still retained their three coats; consequently, he doubted the theory that myomata arise from the muscular coat of the blood-vessels. The cause is sometimes considered as congenital. The influence of heredity, as to whether there is a predisposition to the development

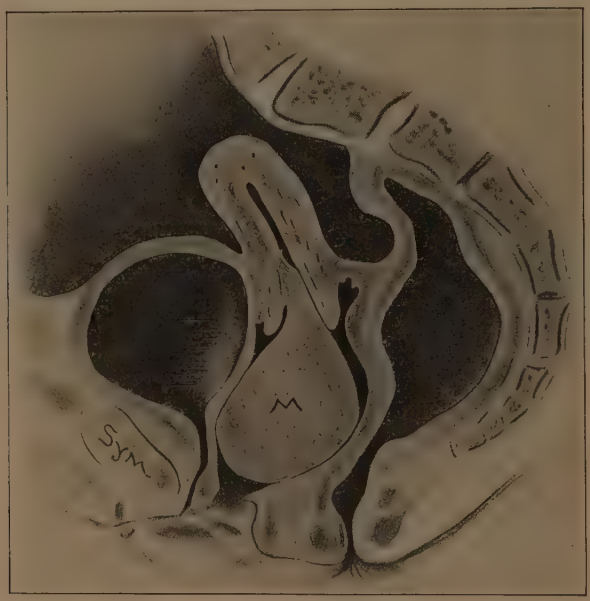


Fig. 455.—Pedunculated Myoma of the Cervix.

of such growths in families, may be questioned. Heredity seems to be manifested in the greater apparent and comparative susceptibility of the colored race to the development of fibroid growths. It is not unusual to find several members of one family suffering from myomata. Among the various causes it is probable that sexual irritation should have the first place, and this irritation may have been engendered without the uterus having undergone the changes incident to pregnancy and labor. The abnormal irritation may be the result of masturbation, of psychic disturbances, of such unnatural processes

as the evasion of maternity, of the psychic phenomena engendered by body-contact with man, of sexual agitation, and of other factors which may produce repeated injurious influence. It is quite possible that defective development or an abnormal position of the uterus may exert a marked influence in the development of these growths. Mann reports a childless widow at the age of forty-three, twice married, who had never menstruated, and for ten years had had a large fibromyoma. It still remains evident, however, that in any individual myoma we can not positively assign a cause which can be considered a definite reason for its development.

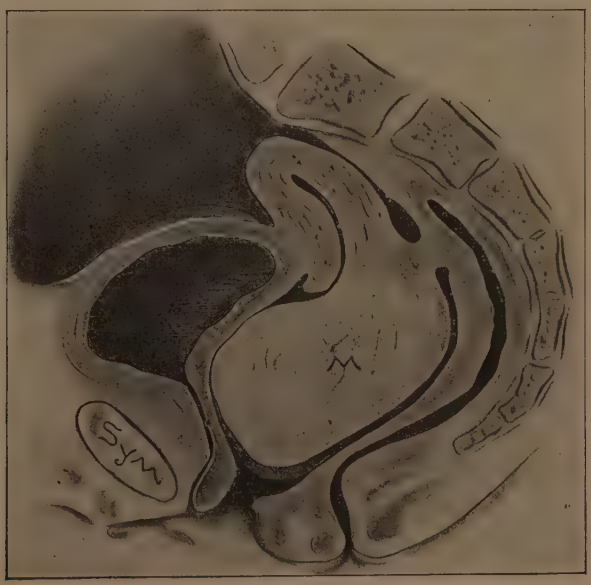


Fig. 456.—Sessile Myoma of the Cervix.

519. Symptoms.—The symptoms which lead us to suspect the existence of myomata are: Hemorrhage, pain, and abdominal cramp, especially when associated with progressive enlargement of the abdomen. The symptoms of the individual case will depend largely upon the variety of tumor present. In the subperitoneal and in the interstitial, which have not encroached upon the uterine mucous membrane, the growth may attain to considerable size without the manifestation of any symptoms which would attract the attention of the patient. Not infrequently, especially in the unmarried, such growths attain to a size so great as to be remarked by the friends

of the patient, before she is herself aware of its existence. The growth will be suspected when the patient has a history of a slow but progressive enlargement of the lower half of the abdomen. Not infrequently, one of the first symptoms will be inability of the patient to properly evacuate her urine. Indeed, there may be even complete retention, which will require the aid of the physician to secure relief, during which the presence of the tumor may be for the first time recognized. It may, in such a case, be situated in the pelvis, completely filling it and pushing the uterus above it. If the growth simply presses against the bladder, it may only slightly interfere with the evacuation, or, which is more likely, cause frequent micturition, because of the inability of the bladder to distend. Urination may be so painful and so frequent as to lead the patient and her physician to suppose that an inflammation of the bladder exists. Such a growth may press upon the rectum, causing constipation, retention of gas, tympanitic abdomen, interference with the circulation in the lower portion of the rectum, the occurrence of hemorrhoids, prolapse, marked anal pruritus, or burning of the anus, the existence of a fissure, and not infrequently the veins of the anus as well as those of the vulva become exceedingly varicose. Such a growth, becoming incarcerated in the pelvis, may cause severe pressure on the surrounding structures with sloughing and gangrene of the pelvic soft parts. An intraligamentary tumor may push the uterus to the opposite side, and the organ may be so small compared with the tumor that its situation is with difficulty determined. (Fig. 458.) Pressure of the tumor on the pelvic nerves may produce pain extending down the posterior surface of the leg in the form of sciatica or a crural neuralgia over the front of the leg, or marked pain in the sacrum. While these symptoms may occur in any form of myoma, they are, however, characteristic of the subperitoneal and interstitial varieties, especially when the latter has not encroached upon the mucous membrane. In the interstitial growth, which grows toward the mucous membrane, giving rise to obstruction in its circulation and leading to engorgement and degeneration of the overlying mucosa, hemorrhage is a marked symptom. In the submucous varieties bleeding is a more or less constant and characteristic symptom. Hemorrhage may be manifested by an increase of the menstrual flow (menorrhagia) or an irregular bleeding (metrorrhagia) may result. Hemorrhage, as before stated, is a very prominent symptom of all submucous growths. The bleeding varies, and is not affected by the size of the growth, since a small polypoid growth will very frequently cause just as severe hemorrhage,—if not greater than that

which occurs from a large tumor. In these growths the menses become profuse and prolonged, resulting in marked anemia and great debility. The bleeding may be continuous and very free for a few days, then a period of brown secretion, to be again followed by profuse bleeding. Blood may be discharged as a bright fluid blood or in large clots. Clotting has no significance, and depends upon the size of the uterine cavity in which the accumulation occurs, or it may take place in the vagina; pedunculated polypi may be associated with severe flooding. Intermenstrual hemorrhage may alternate with periods of amenorrhea, which may continue for months, and when the patient is congratulating herself that she has recovered, another severe hemorrhage occurs. The bleeding occurs from two sources: (1) From the covering mucosa of the tumor; (2) from the general uterine surface. The former is the active primary site of bleeding and is very vascular, particularly in the free variety. In some of the smaller growths the tumor will be found to be quite anemic. In these the hemorrhage is undoubtedly due to its irritation of the circumjacent uterine mucosa. Metrorrhagia from rupture of veins in the superimposed mucosa is frequently associated with a profuse watery discharge, which adds to the depression and prevents the patient from regaining her health.

Leukorrhea, or discharge other than blood, is increased during the development of these growths. The extrusion of the growth into the uterine cavity increases the normal watery discharge from the uterine glands. The interference with the circulation and the consequent hypertrophy of the glandular tissue causes a profuse secretion. This may be truly glandular in character and mixed with the desquamated epithelium. Pus-cells and blood-cells may also be found, according to the degenerative processes, which sooner or later ensue. As the cervix becomes dilated, its glands add their thick viscid secretion to the abundant discharge. The partial or complete extrusion of the growth influences its circulation, not infrequently causing necrosis of portions of its surface or even the entire structure, according to the extent of the constriction. The discharge is often bloody, purulent, or watery, contains necrotic masses of detritus, and produces an extremely offensive odor. The patient, and not infrequently her attendant, has cause to suspect the existence of malignant disease.

Pain is not a constant symptom. It is frequently more a sensation of weight or pressure in the pelvis and upon the surrounding organs. Intense pain may characterize very small growths, but is conditioned somewhat upon their situation. A growth pedunculated or so situated upon the uterine wall

that it projects into the internal os may act as a ball-valve, and be the cause of the most agonizing labor-like pains. I have seen this form of dysmenorrhea in many cases. (Fig. 457.) In one patient it was so severe as to require the administration of two grains of morphin at each menstrual period to render it endurable. An operation subsequently revealed that the patient had a double vagina and a bicornate uterus with two distinct cervical canals in a common cervix. In one of these cavities was found a submucous tumor which, by a nipple-like projection, filled up the internal os, and explained the violence of the dysmenorrhea from which this patient had suffered.

Sterility is a common symptom and conception is the ex-

Fig. 457.—Bicornate Uterus. Both Cornua Containing Myomata.

ception. The inflammatory changes consequent upon the presence of the growth render it unfavorable for the reception and retention of the fecundated ovum. More frequently than is generally appreciated, the tubes have undergone secondary changes which result in the occlusion of their abdominal extremities, and they are found to form retention cysts. Furthermore, pathologic conditions of the ovaries are sometimes found, and this fact, also, is not given the consideration it merits. Constipation, hemorrhoids, anal fissure, prolapse, and pain arising from pressure upon the rectum are more or less constant symptoms and signs. Vesical tenesmus, cysts, frequent micturition, retention of urine, dilated ureter, and hydronephrosis are produced by disturbance and obstruction of the urinary organs.

Not infrequently the first symptom which leads to the discovery of the growth is the retention of urine, from pressure upon the vesical neck. The myomata may also be the cause of retention of urine from pressure upon the ureters, interfering with the entrance of the secretion into the bladder, and, as a consequence, we may have renal dilatation even to the extent of sacculation of the kidneys. In one of my early operations for myoma, upon a patient who had carried a large tumor for some twenty years, death occurred very shortly after the operation. The autopsy revealed that both kidneys were distended, forming thin-walled sacs, that the ureters were several times their normal size, and that their walls had become greatly thinned. The protracted hemorrhages, profuse discharge, severe labor-like pain, and pressure upon the neighboring viscera, are prone to result in a profound anemia, which is characterized by a straw-colored appearance of the skin, often so marked as to simulate cachexia and plainly indicate the gravity of the patient's condition.

520. Diagnosis of Myomata.—The existence of a fibroid growth of the uterus may be suspected when there is a slow but progressive enlargement of the lower part of the abdomen. It may occur in either the single or married woman, and need not be associated with any special indication of ill health. The physician should have in mind the possibility of its existence in every patient who consults him regarding a sensation of weight or pressure in the pelvis, disturbance of urination, such as frequent micturition, difficulty in evacuating the urine, or even sudden attacks of severe retention, which may necessitate the use of a catheter. Indeed, in every such case the condition of the pelvic viscera should be examined preliminary or subsequent to the use of the instrument. Uterine growths should be still further suspected if the patient is complaining of hemorrhoids, fissure of the anus, frequent bleeding from the bowel, pain and distress during, and difficulty in, defecation. The surgeon should never be misled into subjecting a patient to operation or treatment for hemorrhoids until he has examined the condition of the uterus. Only recently I was asked to operate upon a Sister of Charity for severe hemorrhoids, when examination of the pelvic cavity revealed a group of subperitoneal and interstitial fibroids, completely filling up the pelvis, the existence of which she had never suspected. Profuse menstrual flow or irregular bloody discharge occurring in an unmarried woman or in one who does not give a history of the interruption of a recent pregnancy or abortion should lead to the suspicion of the existence of a submucous fibroid growth, particularly where this hemorrhage is associated with pain, often of labor-

like character, as if the uterus were making an effort to expel a foreign body. This hemorrhage will often produce a marked anemia without emaciation, which distinguishes it from that associated with malignant disease. It should be remembered that no characteristic symptoms of myomata occur, and, therefore, the physician is forced to rely for diagnosis and confirmation of his suspicions upon the physical signs. An important factor in this recognition is the consistence of the tumor or tumors in contrast with the surrounding soft structure of the uninvolved portions of the uterus, which permits the determination and delimitation of the growth. The alterations in the shape of the uterus, according to the situation of the tumor, are of interest. A good-sized growth may fill out the organ and give it a spherical shape. The further contraction of the uterus forces the mass into the cervix, where it may distend the entire organ and be palpable at the external os. An intrauterine polypus is determined only by palpation through the cervical canal. If the os is sufficiently open, the pedunculation can be inferred by the mobility, and definitely determined by reaching the pedicle with the finger. In small fibroid growths with a long pedicle, the growth may be felt through the uterine walls to move under the pressure of the finger, even though the cervix is undilated. During the menstrual period with profuse menorrhagia, the offending growth is frequently extruded or the cervical canal is sufficiently dilated to permit its recognition by the examining finger. A growth extruded during the flow is generally drawn back in the interval, and produces what is known as an intermittent polypus. A growth filling up the pelvis may make pressure upon the large vessels and so interfere with the return circulation of the lower extremities as to produce enlargement of the superficial veins in compensation for the obstructed abdominal vessels. Pressure upon the ureters causes dilatation of these ducts, hydronephrosis, dilatation of the pelvis of the kidney, not infrequently a sacculation of the kidneys with destruction of the secreting tissue, the formation of renal calculi, and even the occurrence of suppurative changes. These are characterized by more or less pain and discomfort in the region of the kidney, so much so as to possibly mask the pelvic lesion. Interference with the cardiac or renal functions causes profound anemia and the appearance of cachexia, not infrequently interference with the veins of the lower extremities, phlegmasia, blocking of important vessels by particles of coagulated tissue, and possibly the formation of pulmonary and cerebral emboli. The diagnosis is determined by the bimanual examination, the introduction of one or two fingers into the vagina or the finger into the rectum, and the

other hand over the abdomen. In this way the uterus is carefully palpated and any enlargement of its structure recognized. If such enlargement or hardening of the organ exists, its size, relation to the organ, and its resistance are carefully studied. The fibroid growth has a definite shape, is smooth in outline, is well defined, and has a characteristic resistance. It is important in the study of such growths to arrive at a diagnosis not only as to the existence of fibroid, but also as to the character of growth which may be present. The decision, then, is made whether the growth is an intrauterine or a submucous tumor. The endeavor is made to ascertain by palpating the cervix, when patulous, as to whether the growth is a sessile or polypoid tumor. If the uterus is occupied by interstitial growths, their situation is determined, whether they occupy the anterior or pos-

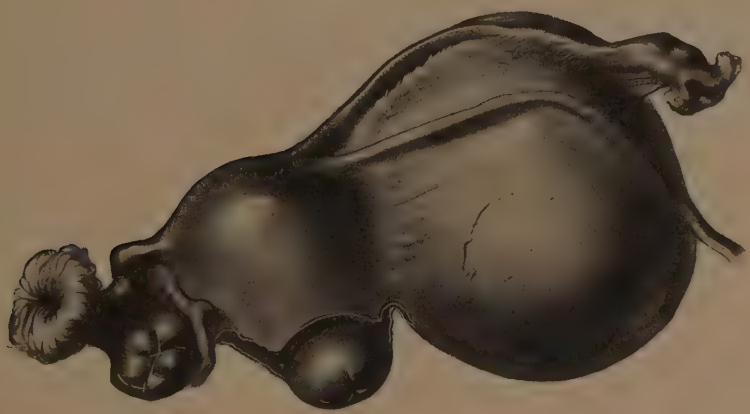


Fig. 458.—Intraligamentary Myoma.

terior wall or the fundus; if subperitoneal, from what portion of the organ they spring. The latter growths are divided into three types: (1) When the growth proceeds from the fundus or the anterior wall, grows upward and in the progress of development becomes pedunculated; (2) whether it is pushed out through the lateral wall of the uterus between the folds of the broad ligament, practically splitting and spreading this out and displacing the uterus to the opposite side (Fig. 458); (3) when it grows downward from the posterior wall and is beneath the peritoneum, but probably not even in contact with it. When the tumor is small and as yet nonpedunculated, it may be difficult to determine by conjoined manipulation from which wall it has originated. This can be accomplished either by the introduction of the sound into the uterus or, better, by the dilatation

of the organ and the introduction of the finger. With one finger in the uterus and the hand over the abdomen or a finger in the rectum, the physician is enabled to accurately determine the relation of the growths to the uterine wall. The factor which should be fixed in mind as an essential one for the recognition of fibroid growths is their smooth, regular outline. In the fibromyomata of the vagina the tumor presents a mass which is situated in the vagina, not infrequently filling it, is quite movable, and between it and the vaginal walls the finger can be easily passed. Its situation external to the cervix precludes the probability of it having undergone necrosis from pressure, but occasionally inflammation may be developed in the vagina from the pressure of the growth, which will lead to agglutination between the tumor surface and the vaginal wall. The attachment of the tumor is recognized by bimanual palpation with traction upon the tumor.

521. Differential Diagnosis of Myomata.—An accurate diagnosis of any condition is only secured by carefully reviewing the conditions with which it may be confused. The conditions with which myomata are likely to be confounded are:

Normal pregnancy.
Extrauterine pregnancy.
Inversion.
Carcinoma.
Sarcoma.
Incomplete abortion.
Subinvolution with endometritis.
Uterine displacements.
Ovarian displacements.
Ovarian cysts.
Pelvic infiltrations.
Sactosalpinx.
Floating kidney.

Normal Pregnancy.—The amenorrhea, subjective symptoms, regular growth of the uterus, absence of hardness in its walls and a sensation of elasticity are generally sufficient to determine the diagnosis of pregnancy. We have already seen that a limited amenorrhea may be characterized by a submucous myoma, and a patient may go for months without a hemorrhage. On the other hand, hemorrhage may occasionally complicate the early months of pregnancy. I formerly attended a patient who always suspected herself pregnant if the menstrual flow was especially free, and she continued to menstruate for two or three months following the occurrence of each pregnancy. The myomata may be present as small, edematous, subperitoneal nodules, which may be mistaken for the extremities

of the fetus. Calcification of a fibroid has led to it being mistaken for the fetal head. The presence of the tumor does not preclude the possibility of pregnancy as a complication. The existence of pregnancy associated with fibroids should be suspected when the growth takes on more rapid enlargement, when the rapidity of the growth is greater than that which usually characterizes a fibroid tumor, and when a portion of the mass presents a sensation of elasticity. The regular shape, size, and outline of the uterus under the bimanual, with the contractions of the pregnant organ, which are absent in the nonpregnant, contrasted with the more or less firm resistance, the irregular enlargement, and the smooth nodular outline, should establish the diagnosis. In diagnosis the following case very graphically illustrates, as shown in Figs. 462 and 463, that fibroid tumors under certain conditions may simulate pregnancy. The patient, about forty-two years of age, had applied to her physician because of an uncomfortable sensation attended with enlargement of the lower portion of the abdomen. On examination, he pronounced her pregnant. This diagnosis was repeated by him after a subsequent examination, and coincided in by other physicians. She came under my observation some length of time after having completed the supposed normal period of her pregnancy and was referred to me as a case of delayed labor. Upon examination, the cervix presented its normal size. Above it, in front, however, could be felt very distinctly two rounded masses with a sulcus between them, which was taken by the examiners to be a fontanelle. The abdomen was enlarged, about the size of a pregnancy at six months. There was a sensation of elasticity or rather of distention in the abdomen. Making pressure against it, a mass could be felt which pushed back on deep pressure, and it could be felt impinging against the abdominal wall when the hand was suddenly removed. This was taken to be ballottement of the fetal body. The bimanual examination, however, convinced me that if this was a pregnancy, it was extrauterine, as the mass could be felt too readily through the anterior vaginal wall to be within the uterine cavity. It was found that the woman continued to menstruate, that the enlargement had increased only to a very slight extent in the last few months. The investigation of the condition caused me to pronounce it one of multinodular myomata, which was a large mass with a rather thick pedicle, permitting it to be pushed away, but strong enough to bring it back against the abdominal wall, and thus produce the sensation of ballottement. The freedom of movement was accounted for by the presence of free fluid in the peritoneal cavity. This diagnosis was confirmed by operation.

Extrauterine pregnancy will present symptoms in the early stage similar to those of a normal pregnancy, as amenorrhea, nausea, mammary changes, etc., associated with a history of colic-like pains on one or the other side of the pelvis, with later a marked tearing pain, possibly attended by fainting, and symptoms of internal hemorrhage. Subsequently a mass will be found in the side or an increase in the size of the abdomen will take place, but this enlargement will be less symmetrical than is the case in a normal pregnancy. The examination of the patient will ordinarily reveal the uterus slightly enlarged, somewhat softened, free from any irregular or nodular masses, possibly displaced to one side, or crowded forward by a mass which is situated in the side of the pelvis or in Douglas' pouch posterior to the uterus. In the advanced stages the parts of the fetus may be felt, probably with greater ease than if the fetus was contained within the uterus.

Inversion.—Inversion of the uterus may be associated with a myoma with a short pedicle, attached near to the uterine fundus. The efforts at extrusion of such a mass, after dilatation of the cervical canal, may cause a dragging upon the fundus and gradual inversion. A polypus with a moderately thick pedicle, when extruded from the os, may be distinguished from the body of an inverted uterus with difficulty. A myoma is said to be less sensitive than the uterus, but this is not sufficiently characteristic to be of much value in diagnosis. The inverted uterus shows upon inspection the orifice of the tube upon either side. In each condition the neck of the uterus can be felt encircling the pedicle of the tumor like a cuff. The diagnosis is best established by introducing a finger into the rectum, while traction is made upon the tumor. In case of inversion the cup-shaped cavity of the inverted uterus will be felt, where in ordinary cases the uterine fundus should be situated. The exercise of recto-abdominal touch, while traction is made upon the protruding mass, will afford an unfailing method of determining the diagnosis. A sound passed into the uterus in a case of a cervical tumor will be found to pass at one side the entire length of the ordinary uterus. In an inversion of the organ the sound will pass an equal distance on all sides of the tumor. The diagnosis, ordinarily, however, can be accomplished without the use of the sound.

Carcinoma and Sarcoma.—Profuse bleeding, pain, and discharge are common to both fibroid tumors and malignant diseases of the uterus. In the majority of cases the offensive discharge associated with malignant disease is not found in myomata. The recognition of this fact has sometimes led to error in judgment; thus, in a case where a myomatous growth

has pushed through the cervix, has been for a length of time constricted by it, caries or superficial necrosis follows as a result of the interference with the circulation in the tumor, from which the careless observer may be led to a diagnosis of malignant disease. A digital examination of such a patient, however, reveals the fact that the vagina is occupied by a tumor which is firm in consistence, is smooth and regular in outline, is not friable nor easily broken down, and thus differs materially from the friable necrotic mass which is found in the vagina in the cauliflower growth of malignant disease. A sloughing fibroid within the uterine cavity may afford some difficulty in the diagnosis. It causes a thin, watery discharge, which is exceedingly offensive. It may have caused repeated attacks of hemorrhage. The associated loss of blood, with the absorption of the products of decomposition from necrotic tissue, produce a condition of sapremia which is with difficulty differentiated from malignant disease. In such cases, however, the diagnosis is determined by dilatation of the uterine canal. The necrotic growth forms a large tumor, one which is more resistant, in which fragments broken away and examined present the regular lamellated structure of a fibroid growth, but nowhere is seen the nesting or collection of epithelial masses surrounded by a connective-tissue stroma pathognomonic of carcinoma or the homogeneous mass of cellular tissue with an absence of true blood-vessels which characterizes the sarcoma.

Uterine Displacements.—Flexions of the uterus are the varieties of uterine displacements most readily confounded with fibroid growths. Indeed, it should not be overlooked that a fibroid growth may be the cause of the displacement. The growth, by its smooth outline and situation, may form such an angle as to cause one to regard it as the fundus uteri. These are the cases in which the sound can be successfully employed to ascertain whether the direction of the uterine canal corresponds to the position of the tumor. The cases are rather few, however, in which the gynecologist can not accurately locate the fundus uteri and detect the relations of the growth thereto by practising the bimanual examination in association with the vagino-abdominal or recto-abdominal touch. Such an examination will reveal the greater consistence of the growth, its rounded, smooth outline, and the extent of its association with the uterus. In a flexion, when the organ is straightened between the internal and external fingers, the normal outline of the uterus is found restored.

Displacements of the Ovary.—The ovary is likely to afford confusion of diagnosis only when it is firmly fixed to the uterus by inflammatory exudate or has become somewhat enlarged.

Its situation, the inability to recognize the ovary in any other situation, and its extreme sensitiveness should reveal its true character.

Ovarian Cyst.—It is frequently difficult to determine the diagnosis between a fibroid tumor which has become edematous and has a long pedicle, and an ovarian cyst of the glandular or dermoid variety. If the cervix is grasped with a double tenaculum, while an assistant, with the hand over the abdomen, draws up the tumor, we are enabled through a rectal examination to ascertain a more exact determination of the relation of the pedicle of the tumor to the uterus. This examination, with the patient under the influence of an anesthetic, will generally be sufficient to determine the diagnosis. It should not be forgotten, however, that the existence of a fibroid tumor does not necessarily preclude the possibility of pregnancy, as we can have pregnancy complicating fibroid growths. I narrowly escaped operating some years ago upon a patient who had a history of having had a very profuse bleeding during the preceding three weeks. The right side of the uterus presented a growth, which was firm and hard, and was recognized as a fibroid. Upon the left side of the abdomen there was more sensation of elasticity or indistinct fluctuation, and it was believed that we had an areolar glandular ovarian growth closely adherent to a fibroid of the uterus. On the day set for the operation, on starting to cleanse the vagina, a foot and leg of a fetus were found projecting from the dilated os, and a partly macerated fetus was delivered. Upon removal of the placenta the uterus contracted and disclosed a pretty good-sized fibroid upon the right side of the uterus. The patient recovered, and with marked decrease of the fibroid growth during the progress of involution, rendering operation for its removal unnecessary.

Pelvic infiltrations are recognized by the previous history of inflammation and the irregular and undefined outline of the masses which are found.

Sactosalpinx is usually preceded by a history of inflammation. The mass is felt at one side of, or posterior to, the uterus. When adherent to the latter, the connection is so irregular and undefined as to reveal its character.

Floating kidney forms a tumor which is generally situated at a higher level. The fingers can be pushed between it and the symphysis and the promontory of the sacrum, palpated below the supposed growth. This would be impossible in a growth connected with the uterus. The floating kidney can generally be pushed back into its normal situation.

522. Alterations and Degenerations.—During the active progress of a myoma it becomes larger, swollen, and more ede-

matous as each menstrual period approaches; and, following the flow, it decreases in size and becomes more firm and resistant. In the submucous and interstitial varieties cessation of the menstrual function or the establishment of the climacteric is delayed, so that a woman may continue to bleed for from five to ten years longer than would be required for the establishment of the climacteric in a woman whose uterus was free from disease. With the establishment of the menopause, however, the growth usually diminishes in size, and undergoes a process of atrophy. The growth becomes firm and hard, and its size remains fixed; or it may become soft, and, with this, a process of metabolism follows, by which the growth gradually disappears. In small growths the same length of time after the climacteric the tumor may have almost entirely vanished. These changes also occasionally take place during the progress of a pregnancy or in nonpuerperal cases without our being able to assign a cause. Not infrequently a patient has been alarmed at the discovery, through examination, of the presence of a fibroid growth, and some months or years later another investigation reveals no indication of its existence. If the second investigation has been made by another physician, he may be inclined to believe that a misrepresentation had been made, and yet do an injustice in giving expression to such a suspicion.

Edema (*Hematoma*).—Edema of large fibroids, especially of the interstitial variety, is not infrequent. The condition is caused by constriction or torsion of the pedicle, through which the venous circulation is obstructed, while the arteries continue to pump in the blood. The decreased circulation in such growths may result in edema as a first stage of a necrobiosis. The interstices of the tumor become filled with serous fluid, so that the entire growth causes a sensation of indistinct fluctuation or elasticity, so marked that only the continuation of the growth with the cervix is sufficient to differentiate it from an areolar glandular ovarian cyst. After the removal of such a growth an incision into its wall will permit the discharge of a large quantity of serous fluid. I once removed such a growth, when a prominent surgeon examining it asserted that it was a fibrocystic tumor. An incision through the structure, however, failed to reveal a single cyst, while nearly a gallon of fluid drained out of the growth in the next two hours following its removal and incision.

Fibrocystic tumors (Fig. 459) result from dilatation of the lymph-spaces in the tumor or degeneration of a portion of its structure, the formation of a cavity, or, in rare cases, separation of the structure of the tumor in edema.

Calcification.—With the maturity of the tumor, and especially the interference with the circulation, the calcareous salts of the blood are deposited in the wall of the tumor, and cause a calcareous mass, or, at least, a shell, which envelops it. In the examination of such a case the sensation of pressure against bone renders it much harder and more resistant than the ordinary mature fibroid. Not infrequently plates of bone will be felt to break beneath the palpating finger. Undoubtedly,

Fig. 459.—Fibrocystic Tumor of the Uterus.

they are similar cases which have given rise to the reported expulsion of uterine calculi.

A submucous or interstitial fibroid having undergone such a change, the subsequent contractions of the uterus cause its expulsion. Amyloid degeneration has been reported in one patient. Fatty degeneration has been evident from the macroscopic appearance of cases I have removed, although it has been asserted that fatty degeneration of such growths is never shown by the microscope.

Colloid Myxomatous Degeneration.—This condition, according to Virchow, is an effusion of mucous fluid between the muscular bands. The presence of a mucin proliferation of the nuclei and small round cells permits of its being distinguished from simple edema.

Inflammation, Suppuration, and Gangrene.—Inflammation of a growth may result from injury, traumatism, compression or obliteration of nutritive vessels of the tumor, and from septic infection following an exploration. Septic inflammation may follow an exploration or the delivery of a patient. The rapid changes which take place subsequent to the delivery of a patient who is suffering from a large fibroid may result in interference with its nutrition and in the development of inflammation and suppuration. Suppuration may take place external to the capsule, in the cellular tissue about it, or in the structure of the tumor. This may have been preceded by mortification of a small part of an interstitial or a submucous growth. The gangrenous portions may be eliminated spontaneously, or may produce putrid infection. When a large growth has lost its vitality, and is still retained within the wall of the uterus, it may gradually disintegrate, slough, and be expelled into the vagina through the cervix as a large sloughing mass, or may produce such marked symptoms from putrid infection that the life of the patient will be sacrificed notwithstanding operative interference for its removal. Such conditions are readily confounded with malignant disease. But recently I was called to see a patient who had been examined by a physician who assured her family that she was suffering from an incurable malignant growth, which must speedily terminate her life. The history of profuse hemorrhage and of an exceedingly offensive discharge, and the appearance of profound anemia and a condition resembling cachexia, afforded apparent confirmation of the correctness of his suspicion. The finger disclosed a large mass filling the vagina, which, instead of being soft and friable, as a cauliflower growth would be, was roughened on its inferior, but smooth upon its upper, surface, was quite movable, and a distinct pedicle could be recognized, which projected from the cervical canal. The neck of the uterus was thin, pliable, and without any infiltrate, which demonstrated that the diagnosis of malignant disease was incorrect, and that the patient was suffering from a sloughing fibroid polypus. In cases of doubt the history, more or less firmness of the growth, the distinct arrangement of the structure, even when gangrenous, and the absence of any cellular infiltrate are sufficient to afford a correct diagnosis. An abscess may develop either in the wall or within the growth itself.

Malignant Degeneration (Fig. 460).—Cancerous degeneration of a fibroid growth has not been demonstrated. The presence of the growth renders the uterus less resistant and facilitates the probability of malignant degeneration of the endometrium. The most frequent malignant degeneration, however, is the infiltration of the fibroid growth by sarcomatous processes.

Fig. 460.—Myoma of the Body and Cancer of the Cervix.

523. Mixed Growths.—Enchondroma, Sarcoma, Osteoma, and Carcinoma.—The origin of these growths is uncertain. It is possible that they must originate in one of two ways—either in transformation of the cells which produce other tissue species, or in an invasion in which the growth is penetrated by the neighboring proliferating masses. Thus, we have myochondroma, myosarcoma, and myocarcinoma. The first of these is very rare. The second is more firm, and grows rapidly from

a small invasion. The normal filamentous structure of the fibroid growth is soon lost in a homogeneous mass, which rapidly becomes necrotic; the tumor then forms a mere thick shell. With the necrosis of the mass, not infrequently vessels are eroded, and extensive hemorrhage may take place into the cavity. The disease is not confined to the growth, but invades the surrounding healthy tissues. The enveloping cells are large, irregular, rich in chromatin, and contain several nuclei. Sänger asserts that all myomatous growths containing irritation cells (myoklasken) are sarcomatous.

Myocarcinoma arises from carcinomatous alteration of the surface of the polypus, or by development from the glandular constituents of an infiltrated adenomyoma.

524. Complications.—The study of the progress of fibroid growth from its origin in the wall of the uterus to its subsequent extrusion, and the changes and lesions to which it may be readily subjected, will afford reasonable explanation for many complications which are associated with it and influence the progress of the growth. Of these complications, the most important, because one of the most frequent, is that of inflammation and the resulting adhesions.

1. *Inflammation*, as we have already seen, may involve the structure of the growth or may influence only its superficial surface. The structure of the growth can undergo inflammation from decreased nutrition by its extrusion into the peritoneal cavity, when it becomes a foreign body, which nature, in its efforts to protect the general structure, surrounds with plastic material, from which the tumor may receive additional and necessary nutrition, and which fixes it in relation to the structures immediately about it. Such adhesions may take place with the intestine, the mesentery, or the abdominal wall, and may lead, through traction upon the tumor, to still further thinning or attenuation of its pedicle, and, finally, to separation from the body of the organ, so that occasionally such growths are found removed from the original attachment and nourished through the inflammatory adhesions. The causes for inflammatory changes may be divided into (1) those incident to alterations in the tumor; (2) to irritation-changes in the peritoneum from the presence of the growth as a foreign body; (3) to infection. Infection may arise from disease of the appendix, the Fallopian tubes, or through direct transmission from the intestinal cavity.

2. *Ascites.*—A second, though less frequent, complication of myomata is ascites (Fig. 462). This is likely to be produced by an irritation of the peritoneum from pedunculated subperitoneal growths. (Fig. 463.) It is possible that it may

be engendered by want of vitality in the growth, which makes it a foreign body and leads to irritation, which results in ascites. Ascites is much more frequent in malignant than in benign growths, and its presence should always awaken the suspicion that very grave changes have taken place in the growth.

3. *Disease of the Tubes* (Fig. 461).—Disease of the Fallopian tubes as a complication of the presence of fibroid tumors is very common. It may be a simple hydrosalpinx or a pyosalpinx. Adhesions may be extensive, and very greatly complicate any operative procedure. The most frequent cause of this condition is undoubtedly the result of infection which has traveled through the uterus. The presence of the fibroid growths favors the congestion of the pelvis, and makes the tubal mucous membrane a more favorable soil. Pressure of the growth upon a Fallopian tube may interfere with its circulation, cause a distention of its cavity and the formation of a tubal collection. This

Fig. 461.—Myoma Uteri Complicated by Pyosalpinx.

defective drainage causes regurgitation into the pelvic peritoneum from the abdominal end of the tube, which sets up a peritoneal inflammation, and produces a gluing up of the tube and the formation of a hydrosalpinx or pyosalpinx, according to the exposure to or absence of infection.

4. *Ovarian Cysts.*—The existence of fibroid tumors does not necessarily increase the tendency to ovarian growths, nor does their presence preclude the development of cysts in the ovary. The presence of an ovarian cyst with its rapid development may greatly increase the distress of a patient who is suffering from a large fibroid tumor, and may necessitate earlier resort to the physician for relief. In very large ovarian cysts a fibroid growth may frequently be overlooked, and detected only during operative interference in the treatment of the former.

5. *Pregnancy.*—The presence of fibroid growths increases the tendency to sterility, but does not necessarily preclude the existence of pregnancy. Recognition of the existence of pregnancy is of the very greatest importance, as the progress of the condition may have a marked influence upon the rapidity of the growth, while the growth may favor the premature interruption of the progress of pregnancy. This complication is

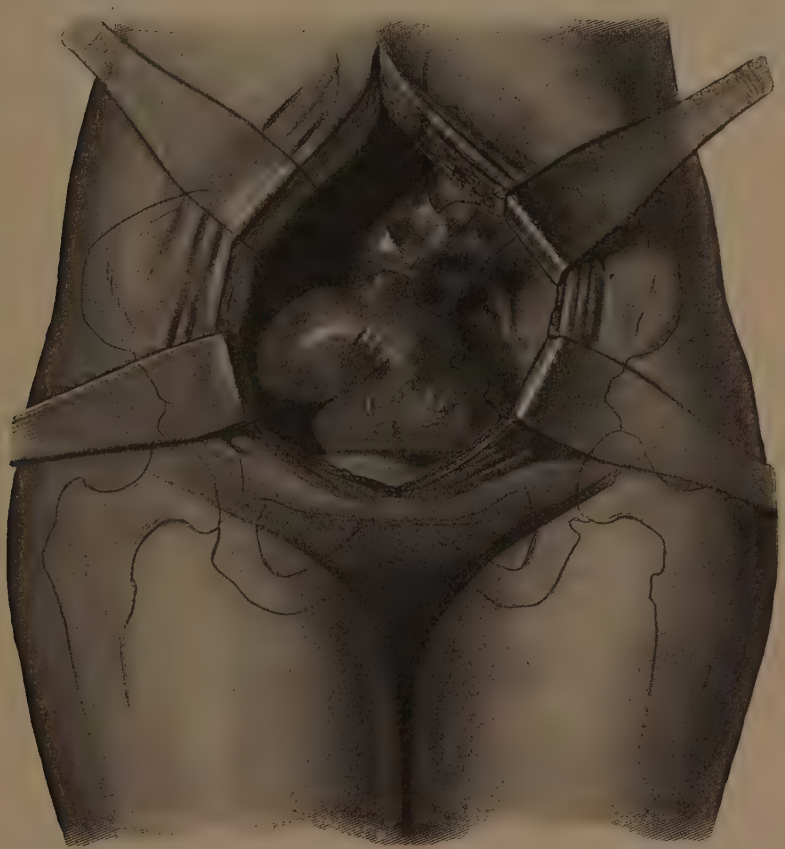


Fig. 462.—A Myoma Which, from the Associated Ascites, Had Been Mistaken for Pregnancy.

of so much importance that it may be studied from various standpoints.

525. (*a*) **The Influence of the Myoma upon Conception.**—It can be readily understood that the presence of a fibroid growth—for instance, of the polypoid or submucous character—renders the mucous membrane of the uterus unprepared for

the retention of the fecundated ovum, and not infrequently the removal of a polypus from a woman who has been sterile for a number of years is very shortly followed by conception, even though years of sterility had preceded. The engorgement of the uterine mucosa, occasioned by the presence of a sessile submucous or of an interstitial growth, which encroaches upon the uterine canal, the profuse and irregular hemorrhages accompanying its progress, associated with the constant and excessive secretion from the glandular structure, present conditions exceedingly unfavorable for the fecundation of the ovum.

526. (*b*) **Influence of Pregnancy upon the Myoma.**—The increased congestion of the uterus incident to pregnancy causes

Fig. 463.—Tumor Shown after Removal.

greater nutrition of the growth, results not infrequently in its rapid increase in size, and the growth which was situated in the pelvis is of itself raised out of it, and forms a more formidable mass. In some cases the growth is slow, adhesions may so fix and bind down the uterus that it can not rise out of the pelvis, and we may have as a result an impaction of a mass in the pelvis similar to that which occurs in the gravid retroflexed uterus. Sometimes the rise of the growth in the pelvis may be rapid, or it may be situated low in the pelvis, and not emerge from it until between the sixth and seventh months. Intraligamentary

growths become altered by the pressure and cause very marked distress. The fibroid polypus or submucous tumor is sometimes extruded into the vagina, whence it may be removed without any indication of interference with the pregnancy. Marked changes in size, form, and consistence of the uterine growth may be noticed. The increase in size is often due to edema. Venous engorgement frequently occurs as a result of obstruction of the veins, while the blood is continually poured into the structure by the less readily controlled arteries. Where a number of fibroid growths are situated together in the pelvis they not infrequently become nonpedunculated subserous growths, and often become flattened from pressure. The circulation can be obstructed to

Fig. 464.—Myoma Complicated by Pregnancy.

such a degree as to result in necrotic changes. Such changes require early and prompt interference in order to save the life of the patient.

527. (*c*) **The Influence of the Myoma upon Pregnancy.**—An intrauterine growth, covered as it is by mucous membrane, predisposes the subject to increased bleeding. This hemorrhage and the changes in the uterine mucous membrane may be so marked as to result in premature interruption of pregnancy; or the ovum may be lodged low in the uterine cavity, causing the formation of the placenta over the cervix,—what is known as placenta prævia,—in which the life of the mother will become more

endangered as the pregnancy progresses. The situation of the tumor may favor retroversion of the gravid uterus and its impaction in the pelvis, or the tumor itself may be impacted with the development of the pregnancy. The presence of a fibroid growth, with its pressure upon the tubes, may cause the development of a tubal pregnancy, which may remain unsuspected until its rupture into the abdominal cavity occurs, with the accompanying peril to the patient.

528. (*d*) **Influence upon Labor.**—In the majority of small fibroid growths, especially those which have not attained to a size larger than a walnut or an orange, the presence of the growth produces but slight, if any, influence upon the progress of the labor. Tumors of a larger size, which are situated in the pelvis, may interfere with labor and require operative interference for their previous removal. Occasionally, with changed position of the patient and elevation of the hips, the tumor may be pressed out of the pelvis, or a tumor situated so low in the pelvis under the dilatation of the os and elevation of the cervix as the dilatation progresses, may be lifted out of the pelvis. Interstitial and subserous growths, with a broad base, cause irregular and ineffective uterine contractions, which affect the progress of labor. The existence of myomata has been found to greatly complicate the results. Winckel, comparing the statistics of one hundred and forty-seven cases of labor complicated with myomata with those suffering from contracted pelves, said 5 to 6 per cent. of parturients with contracted pelves perish during labor, but when complicated with myomata, 50 per cent. succumb. The infantile mortality is often more serious. Nauss found the infantile mortality to be 66 per cent. Lefour, in three hundred cases observed, gives 77 per cent. Large subserous growths, when above the pelvis, in or near the fundus of the uterus, exert no influence upon the progress of the labor. Cervical growths, however, are very important, as from their situation they may occupy a position below the level of the cervix, and necessarily interfere with the delivery of the fetus, but even when the growth is thus found in the pelvis it is often spontaneously raised as the process of dilatation proceeds. Submucous growths may be extruded into the vagina previous to the inception of labor and then be removed. If the tumor becomes edematous, it is more compressible and less of an obstacle to the progress of delivery.

529. Course and Prognosis.—Many of these growths, especially when small, produce very few symptoms, and those quite vague. Others cause serious disturbance until the occurrence of the menopause, after which the great majority of tumors undergo atrophy and diminish by induration during the process of involution. The process of atrophy is occasionally hastened by

pregnancy, so that patients who have been recognized as suffering from a fibroid growth have the tumor entirely disappear by the completion of the pregnancy; or, in other cases, during the subsequent convalescence. Occasionally, there is a marked breaking-down of the health, associated with fibrous cysts or fibromyomata, and particularly after the critical age. The tumors that remain quiescent are not necessarily small, but can reach to the level of the navel, so that the patient may be entirely ignorant of their presence and only be made aware of the existence of the growth by an examination that is made for some intercurrent condition, or for the treatment of symptoms produced by the tumor, of the cause of which the patient had previously been in ignorance. In the majority of cases the tumor does not threaten life either directly or indirectly. In this respect these growths are quite different from carcinoma or an ovarian tumor. The carcinoma demands immediate operation, as soon as discovered, for life is destroyed by its progress; but in myomata such advice must be modified, for in many cases the growth is not even the cause of the disease for which the aid of the physician is sought. In others it may be productive of disturbance. In myomata of large size, which reach above the umbilicus in young individuals, the prognosis as to time is good, but there are possibilities of it becoming worse. In a woman who has not reached the age of thirty-five years, and a tumor attains a size corresponding to that of a pregnancy at full term, one can with security assert that the life of the individual is threatened, and the capacity for suffering must be limited. Attention should be directed to the symptoms that threaten life. The operation in such cases is no longer elective, but necessary, as the percentage of danger from the operation is more trifling than from the unfavorable influence produced by the growth of the tumor. In such cases, in order to produce conviction we should be able to assert that the operation is advisable, and can not be postponed for ten or twenty years with the hope that the patient will still manifest good powers of resistance and a fair chance for recovery. If the tumor comes under observation at a later date, near the middle of the fifth decad,—about forty-three to forty-five years of age,—we must be governed by the symptoms. It is possible that the tumor may swell during menstruation, and that after its final cessation a more secure and much more considerable diminution appears. In such cases we can wait until symptoms appear. In all cases the prognosis is dependent upon the age and its relation to the tumor. Great size of the tumor and its complex symptoms affect the future course. All complications that increase the size of the tumor render the prognosis the worse, the younger the age of the patient. In these cases we have to determine that not the

tumor but the complications are the cause. Complications that may be regarded as hazardous in the young are less serious in the older, because the longer duration of the disease renders the organism more accustomed to its existence. The prognosis is very bad in cases of severe heart affections, as fatty degeneration, though this is difficult to recognize in the living. Other complications may render the prognosis of the myomata bad, but not necessarily make the prognosis of operation worse. The first indication of heart affection should be regarded as an indication for prompt operation. The prognosis is rendered much worse if the myoma has undergone a malignant degeneration, which, however, is rare. The rapid growth of the tumor is not necessarily an indication of malignant change, but more of cystic degeneration, which renders the prognosis of the further continuation of the growth worse, approaching in this respect the ovarian condition. The prognosis of all small tumors, especially those which cause more or less hemorrhage, is not necessarily unfavorable. The danger is never so great as it appears to the patient. The discomfort produced by the condition and the anxiety about further duration and increase of bleeding impel the patient to consult her physician. In such cases it is difficult to arrive at a correct judgment, as the patients do not appreciate the fact that life is not necessarily threatened when menorrhagia is profuse. In the consideration of methods of treatment we must keep in mind the fact that the productive activity is injured, even though a bad prognosis is not to be asserted. The danger lies in the long duration of hemorrhage, which thereby renders worse the general condition. The prognosis is more grave when there is more marked general disturbance. In many cases the appearance of hemorrhage can be regarded as a favorable indication, as it proves that the spontaneous discharge of the tumor is taking place, following which the prognosis is improved.

While it is true that a fibroid growth usually undergoes an abatement of its symptoms with the advent of the menopause, yet it should not be forgotten that the existence of such a growth generally delays the climacteric beyond the ordinary period of life at which it should occur. Occasionally, the natural evolution of a tumor, which results in its conversion into an extraperitoneal or intraperitoneal growth, may cause rupture of its pedicle, from the weight of the tumor alone or from thinning of the pedicle. By straining in defecation or in vomiting, a polypus may be expelled. The rupture of a pedicle may limit the subsequent progress of the growth, or it may remain grafted to the point where it has formed adhesions and be subsequently nourished, or it may lie free in the peritoneum and undergo mummification. A more serious spontaneous extrusion is mortification or gangrene of a

tumor which has been expelled toward the uterine cavity. Perforation of some of the neighboring organs may occur, as, the bladder, the rectum, the rectovaginal pouch, or the abdominal wall. The two former conditions end in death; the latter, in possible recovery; or, finally, the tumor may be absorbed. Causes of death are profound anemia from repeated hemorrhage; successive attacks of chronic peritonitis; disease of the kidneys; uremia and heart failure; rupture of cyst; or inflammation and gangrene. Sudden death has been observed as a result of embolism. Exploratory puncture favors the production of thrombi in the large venous sinuses. Death from shock after intravenous rupture has been reported. In very small growths which have been extruded beneath the peritoneum, and by their relations show no evidence of taking on growth, it is preferable that the patient should be left unaware of their existence. The various complications to which these growths are subject; the alterations which they may undergo during their progress; the influence upon the health of the individual from pressure upon important viscera; the danger from separation of growths and subsequent gangrene; the possibility of their continued nutrition and growth subsequent to the menopause; and the occasional malignant degeneration of the mass, associated with the diminished mortality by early operative procedure, particularly that of hysterectomy, would render it advisable that the extirpation of the growth should be practised. In the young the possibility of the occurrence of pregnancy with its attendant dangers is an important factor, and one which may be an indication for treatment. When a woman possesses a condition which insures a maternal mortality of 50 per cent. and an infantile loss of 75 per cent. or over, it becomes a serious question whether she should be advised to marry, or, if married, should not be subjected to prompt operative interference.

530. Treatment.—The mere discovery of the existence of a myoma must not be considered as a necessary indication for its removal, or even treatment. In this respect myomatous tumors differ from ovarian growths and from cancer, for the latter must be removed early, because their continued existence results in destructive influences upon the organism. The myoma must cause symptoms in order to indicate interference. The external relations of the patient must play a great rôle in the method of treatment—the capacity of resistance, the ability to undergo rest during menstruation, and to avoid severe bodily labor; consequently the treatment is different in the working class, who can not rest, from that which must be practised in those who are able to take care of themselves. There are some cases in which hygienic and dietetic rules must govern.

Neither the growth of the tumor nor the strength of the hemorrhage will necessarily be influenced by the methods of treatment; but by the avoidance of severe bodily effort and the promotion of nutrition, disturbance of the health equilibrium is avoided.

The patient should be cautioned as to her manner of dress, and advised to wear loose clothing, since it would be exceedingly detrimental to force down into the lower part of the pelvis a myomatous uterus by wearing a tight corset. Tight clothing over an abdomen containing such growths may very readily produce inflammation which will lead to extensive and unfortunate adhesions. When the abdominal wall has become greatly weakened by previous distention or the weight of a large tumor following the climacteric, the comfort of the patient may be greatly enhanced by wearing a binder or support which will prevent the organ from falling forward. In such cases and in growths predisposed to the occurrence of torsion, a radical operation is indicated. Schröder attempted to fasten very movable tumors by sutures through the abdominal wall. Such a plan of treatment is not only unsatisfactory but dangerous. The very profuse hemorrhage which frequently occurs requires that the nutrition should be carefully maintained and that all excesses of Bacchus and venery should be avoided. Preceding and at the menstrual period the patient should be kept in bed and an ice-bladder or cold applications should be placed over the abdomen. Tea and coffee should be interdicted, because experiments have demonstrated that both these articles increase the tendency to profuse bleeding. Various baths and mineral waters have been advocated as especially efficacious. Among these are the Kreuznach, Tolz, and Halle, in upper Austria, which are largely impregnated with iodin and bromin, and the Franzensbad and Elster, in which sulphur is an important element. These waters probably exert their influence, not so much by their direct effect upon the tumor as by the improvement of general nutrition. The health is built up, complete rest is secured, and the appetite is improved, and thus more or less relief is obtained. The treatment may be divided into:

(*a*) Medical.
(*b*) Electrical.
(*c*) Surgical.

531. (*a*) **Medical Treatment.**—The medical treatment should consist in the employment of remedies and hygienic measures directed to promote the general nutrition of the patient and ameliorate the unpleasant symptoms. Such treatment must be largely symptomatic. The list of remedies advocated for

the treatment of uterine myomata is very extensive; but, as is usually the case, the larger the list of remedial agents, the less beneficial the influence exerted. Notwithstanding the effective results that have been attributed to many different remedies, the history of myomatous growths discloses that they normally undergo peculiar changes, becoming sometimes larger and at others smaller. Occasionally the growth disappears without any assignable cause. Such fortunate results have added to the reputation of certain remedies, when similar conditions would probably have taken place had they not been administered. The agents which are most likely to exert an influence upon the progress of the growth are those which produce an effect upon the muscular coat of the organ, and belong to that class known as oxytocics, of which ergot is the principal. Ergot may be administered by the stomach, by the rectum, or by hypodermic injection. Its employment by the stomach causes more or less disturbance of the digestive tract, nausea, and vomiting. Moreover, in order to secure any beneficial effect from its employment, it must be continued over a long period of time, which renders this method of administration objectionable. Ergot in combination with a vegetable astringent will sometimes exert a favorable influence in decreasing and arresting a severe hemorrhage. It may be employed in the following combinations:

℞. Ext. ergot, ... f℥j
Extract hamamelis,
Tinct. cinnamon, ... āā f℥ss. M.
Sig.—f℥j every two or three hours.

Or:

℞. Ergotin, ... gr. ij
Hydrastinin hydrochlorate, ... gr. ¼.
M. ft. capsulæ No. XXX. Sig.—A capsule to be taken every three or four hours.

The fluid extract of cotton-root or an extract of Ustilago maidis, the ergot of corn, acts similarly to ergot, though to a less marked degree. When a patient suffers from expulsive efforts of the uterus, these may be ameliorated by the addition of extract of cannabis indica, gr. ¼ to each dose. Ergot is most effective when administered by hypodermic injection, using either the sterilized fluid extract, the normal liquid, or ergotin. The agent should be thoroughly aseptic, should be injected in close proximity to the tumor, preferably in the abdominal walls, and the caution should be taken to make the injections deeply into the muscle, since they will then be less likely to be the cause of abscess. Ergot acts in two ways: By stimulating the muscular coats of the blood-vessels, thus cutting off the

supply of blood sent into the uterus; and, secondly, by increasing the activity of the muscular structure of the organ. Fibroid growths which are situated in the uterine wall are by its influence more readily expelled, either intraperitoneally or extraperitoneally. To be efficacious, the drug must be continued over a long period of time. When thus employed, it exerts an influence upon the muscular coat of the blood-vessels throughout the body, increases the danger of arterial sclerosis and the establishment of pathologic processes more serious than those for which the drug was administered. Among some of the drugs for which a reputation has been made by the retrogressive processes through which fibroids naturally pass may be named the potash and ammonium salts, particularly the bromid, the iodid, and the chlorid of ammonium. How much influence any of these drugs will exert upon the progress of the disease is an undetermined question. Among other drugs that have been employed are sulphuric and gallic acids, turpentine, cannabis indica, extract of hamamelis, extract of hydrastis canadensis, and the active principles of the latter agent, hydrastin and hydrastinin. The latter agents exert a very favorable influence by constringing the blood-vessels, and thus serve to control hemorrhage. Efforts have been made to bring about the absorption or destruction of fibroid tumors to compensate for the deprivation of certain nutrient elements which enter largely into the composition of the growth. A diet composed of the carbohydrates seems to have been in some few cases effective. Sir J. Y. Simpson, recognizing that the calcareous degeneration of a fibroid limited its further growth, purposed to accomplish this phenomenon by the administration of large doses of chlorid of calcium, but he soon found that this drug produced calcareous plates in the aorta and in the valves of the heart, and thus caused conditions much more grave than that for which it was given. In recent years the extract of thyroid gland has been advocated to reduce the size of growths and assist in the arrest of hemorrhage. As patients vary to a great degree in their susceptibility to the influence of this agent, it must, therefore, be employed carefully, increasing the dose gradually from three to five grains a day to the largest amount the sensibility of the patient will permit. In exophthalmic goiter, or in irritable conditions of the heart, the drug is badly borne, even in small doses. In some cases of fibroid growths in which I have employed it, the drug has produced such an effect upon the nervous system that its use had to be discontinued. Without question, it exerts an influence upon the lining structure of the uterus, and to this extent is beneficial in lessening the tendency to hemorrhage. Polk and Mann claim to

have seen very pronounced effects from this drug in the diminution of the size of the tumor, but that it has any permanent influence is very questionable. Shober employed the mammary gland extract with apparent benefit in a limited number of cases, but the results do not seem to have given sufficient encouragement to continue it. Probably the extract of the suprarenal gland or its active principle, adrenalin, is more effective than any of the other agents we have mentioned in stimulating the muscular coat of the blood-vessels, thus lessening the tendency to hemorrhage. Various local measures have been employed, such as injections into the vagina. These, however, can have no influence on hemorrhage from the uterus, as the coagulation of the blood in the vagina will be insufficient to afford any obstruction to the severe uterine hemorrhage. Ice-water was formerly employed, later hot water. Both agents are efficacious in the field of obstetrics, but they have but little influence upon fibroid tumors. The agent must come directly in contact with the affected endometrium to be of any service. When hemorrhage is very marked and uncontrollable, and threatens the life of the patient, the vagina or even the uterine cavity may be packed with iodoform gauze, which acts as a tampon and thus controls the bleeding. When the uterine canal is opened, its cavity may be irrigated with hot water or vinegar and water, or a solution of perchlorid of iron, tincture of iodin, and other agents for the purpose of arresting hemorrhage. These agents are sometimes quite effective for a length of time, but their use is not unattended with danger. The uterine canal should be so patulous that the subsequent drainage can be complete, but even in such cases the method of treatment is not infrequently attended with danger. I well remember a patient in my early experience who had a large fibroid tumor, which occasioned frequent attacks of profuse bleeding. The cervical cavity was quite patulous, and with a uterine syringe I injected tincture of iodin into its cavity. Almost before the syringe could be withdrawn the patient complained of tasting the drug, and within a few moments she had a most violent attack of pulmonary edema, which threatened her life, and from which she recovered only after a protracted illness. Moreover, this state was followed by prolonged mental disturbance. Needless to say, I have not been inclined to regard this plan of treatment with a great deal of confidence.

532. (*b*) **Electric.**—Electricity has been practised in the treatment of fibroid growths for many years. The methods of application of the agent were crude, and not infrequently were attended with great danger, especially when punctures were made through the abdominal wall directly into the tumor

by an insulated needle, which thus produced a direct and localized influence upon the structure immediately in contact with the poles. It remained for Apostoli, by his method of measuring the current and fixing the direct dosage, to evolve a plan of treatment which can be practised with a certain degree of precision. Under ordinary means the passage of a current of from five to ten, or at most twenty, milliamperes is attended with considerable discomfort. By his apparatus and method of procedure from 100 to 200 milliamperes are employed. This is accomplished by the application over the external surface of a large, comparatively inactive electrode, while a more active electrode is introduced into the vagina, or, preferably, into the uterine cavity. He further defined the influence of the positive and negative poles. The positive pole was recognized as producing a decomposition of the fluids about it, which resulted in the accumulation there of an acid, while about the negative pole accumulated alkaline fluid. The former is the more destructive in its influence, and hence is more particularly of value in diseased conditions of the mucous membrane which cause hemorrhage. The application of the positive pole within the uterus causes an electrolytic or cauterizing action, which results in coagulation of the blood in the vessels and in the arrest of bleeding. The negative pole, on the other hand, by its influence produces edematous infiltration of the tissues at some distance from the pole, and the subsequent absorption decreases the size of the growth. For the practice of Apostoli's treatment, then, are required: First, an electric battery sufficiently large to give a current strength of from 200 to 300 milliamperes without its wearing out too rapidly; second, a galvanometer capable of measuring 500 milliamperes; third, a rheostat, by which the strength of the current can be gradually increased. The current chooser—an instrument by which the current can be changed from positive to negative without the removal of electrodes—is important. It must be kept in mind in the use of this instrument, however, that the strength of the current must be very greatly reduced before such a change is made, as otherwise the patient would receive a violent and painful, if not a dangerous, shock.

Electrodes.—The external electrode, to be placed over the abdomen, is of large size, and consists of the clay pad of Apostoli, of the bladder or water electrode, as advocated by Martin, or of a towel wet with a salt solution and over which the electrode is placed. The intra-uterine electrode consists of a probe insulated within a couple inches or more of its point, as may be desired. An ordinary probe with a gutta-percha hood which can be slid over it affords an efficient electrode. The electrodes

are placed in position before the current is turned on. The latter is applied gradually, watching the galvanometer and the expression of the patient to ascertain the sensibility. The internal electrode is made of platinum or carbon, these agents having more endurance. As large quantities of strongly acid material accumulate about the electrode, the less durable metals would be very quickly destroyed by electrolytic action. In the application of electricity the vagina should be thoroughly cleaned in order that no infection shall be carried into the uterine cavity. It is recognized that electricity is a powerful antiseptic, but it is only in the stronger doses that it exerts such an influence. The application of electricity may be made two or three times a week, according to the intensity. When strong currents are used, but once a week is preferable. The seance lasts from five to fifteen minutes. Previous to the application of the external electrode the skin of the abdomen should be carefully examined for breaks in the corium, by denudation from scratching, or from the presence of furuncles. Any irritated points should be treated, and should be excluded from contact with the electrode by the application of collodion or pieces of plaster to insulate it. The external electrode is placed upon the abdomen and is connected with the battery; the internal electrode, also connected, is introduced, but with the precaution to have the current closed. The current is then opened slowly and carefully, and is gradually increased to the point of tolerance. The current is gradually reduced before the withdrawal of the electrode, to prevent the patient from being subjected to a severe shock. In the beginning of the treatment it is important that the current should be governed with the greatest care, and currents of moderate intensity only employed, until the degree of toleration is determined. It is difficult to fix the number of applications to be required—generally from twenty to thirty.

Electropuncture of the Myoma.—Occasionally, the situation of the tumor may be such as greatly to displace the external os and to render the canal tortuous and difficult for the introduction of the electrode. In such cases puncture may be made into the myoma through the anterior cervical wall. Just as rigid antisepsis should be practised for this procedure as for the most serious operation, and as it is not infrequently quite painful, an anesthetic should be employed. The puncture of the vagina is from one-half to one centimeter deep, and is performed without the employment of a speculum. Previous examination will disclose the position of the uterine artery, which should be avoided; also, care should be exercised not to injure the bladder or intestines.

Electricity exerts its influence in three ways:

(*a*) In the diminution of the tumor from one-fifth to one-half of its original size. Complete disappearance is exceedingly rare.

(*b*) In a most marked influence upon the hemorrhage.

(*c*) In the relief of pain.

The disappearance of pain and the arrest of hemorrhage necessarily result in the improvement of the general condition of the patient. Apostoli gives the following contraindications: First, hysteria; second, intestinal catarrh; third, pregnancy; fourth, malignant degeneration of the tumor; fifth, fibrocystic tumors.

Some of his followers do not consider hysteria an absolute contraindication, but Apostoli has made the observation that the hysteric possess a very great intolerance to the electric current, making it impossible during the course of a sitting to introduce a sufficiently high current to bring about favorable results. In intestinal catarrh the current has a strong influence on the solar plexus, which calls forth severe contraction of the intestinal muscle. It can be readily understood that the presence of malignant growths must necessarily offer a direct contraindication to the electric treatment. The diagnosis is sometimes difficult to determine. Kellogg has asserted that in a myoma which after the menopause shows a rapid growth malignant degeneration is undoubtedly taking place, and that electric treatment should be withheld. In fibrocystic tumors the gas accumulation after the electric treatment may lead to suppuration. Gehrung, in order to avoid this, employs a puncture cannula, so that the fluid contents of the tumor can be drawn off. The presence of pus in the adnexa, as mentioned by Apostoli, is a very frequent complication, and one often difficult to recognize. The employment of electricity in such cases is unexceptionally harmful. It is unnecessary that the inflammation should have gone on to suppuration in order to make the treatment objectionable. Very acute or subacute inflammation in the environment of the uterus is a positive contraindication to electrotherapeutics.

Further, a very important contraindication for electric treatment depends upon the situation of the tumor and its relation to the uterus, and justifies the following statement:

(*a*) In subserous tumors, particularly when they are pedunculated, electric treatment will have but little beneficial effect, and is likely to prove injurious.

(*b*) A pedunculated submucous fibroid affords no special advantages for electric treatment.

In an inconsiderable number of cases suppuration of a poly-

pus has resulted from intra-uterine electric treatment. Not infrequently has a fatal result appeared, or total extirpation of the suppurating organ been performed, with or without favorable result. Other contraindications, in addition to those named, are heart failure and acute nephritis. In very hard tumors the employment of electricity is opposed by Parsons, as they can not be influenced by it.

Colossal Tumors.—In studying the influence of electricity upon the tissues we must take the polar and the interpolar.

1. *The Polar Influence.*—This incidentally depends on the progress of electrolysis of the soft tissues. In the passage of the current from the metallic body, in fluid destruction which takes place in the salt solution, and about the positive pole an acid is formed, while the metal surrounds the negative. Similar changes occur in the tissues of the body, so that about the positive pole acid material, such as carbonic acid and chlorin, is set free. In the cathode watery material the alkalies are collected. It is asserted that these materials in the nascent state exert a strong chemic influence. Albumin is coagulated, the vessels are narrowed, and a hard, dry, brown-red slough occurs, while under longer employment the tissues are destroyed. About the negative pole a soft, succulent, glue-like, easily scraped off white slough occurs, as if one had employed concentrated caustic potash. Consecutive hemorrhages may follow the employment. The negative current is absorbent, and is much more painful than the positive. Investigations have demonstrated that the positive pole acts more on the cell germs or cellular tissue, and the negative upon the protoplasm. The latter is more diffuse, while the former has a sharper limitation.

2. *The Interpolar Method.*—Apostoli's critics assert that the methods are not without danger. The principal dangers of myoma operations are hemorrhages and sepsis, but we have radical operations which present various series of dangers, embolus, pneumonia, ileus, and death from chloroform, without considering the later disturbances of nutrition. When we come to consider the advantages and disadvantages of electric treatment, we are led to the conclusion that it should be confined to the uncomplicated cases, while those cases which threaten life should be subjected to operative treatment.

533. (*c*) **Surgical.**—The surgical treatment of fibroid growths may be either palliative or radical, but we will consider the procedures under the two divisions of vaginal and abdominal, according to the route by which the tumor is most accessible and may most readily be subjected to treatment.

The vaginal procedures consist in:

1. Dilatation and curetment.
2. Incision of the cervix.
3. Incision of the capsule.
4. Removal.
   (*a*) Torsion.
   (*b*) Incision of the pedicle.
   (*c*) Enucleation.
   (*d*) Morcellement.
5. Ligation of the vessels.
6. Hysterectomy.

The abdominal route includes:

7. Castration.
8. Ligation of vessels.
9. Myomectomy.
10. Enucleation.
11. Supravaginal amputation or partial hysterectomy.
12. Panhysterectomy.

Vaginal Procedures.

534. (1) Dilatation and Curetment of the Uterus.—Dilatation of the uterus may be indicated as the first stage in treatment of the uterine growth or for the purpose of diagnosis. It may be accomplished by the mechanical dilatators of Hegar, but without tearing the neck they will not afford sufficient dilatation of the cervix to permit the introduction of the finger. The preferable method of dilatation is the employment of a laminaria tent, and the vagina should be thoroughly cleansed and rendered as nearly aseptic as possible before its introduction. The os is exposed by a Sims speculum or perineal retractor. The cervix is seized with a double tenaculum, the os exposed, the plug of mucus filling the cervical cavity removed, and the canal thoroughly disinfected; then as large a tent is selected as can readily be introduced, or, when the canal is pretty well dilated, a nest of tents may be employed. These tents should be previously sterilized by heat and placed for a few minutes before their employment in a saturated solution of iodoform in ether or in a mixture of equal parts of carbolic acid and alcohol. After the introduction of the tent iodoform gauze is placed beneath it to protect the parts from infection and to keep the tent from being extruded. Usually, at the end of twelve hours the cavity will be sufficiently dilated to permit the introduction of the finger. If the dilatation is insufficient, the canal can be enlarged by the employment of Hegar's bougies, or with a second series of tents. The exposure by dilatation permits the situation of the growth and its size and relations to be recognized. The curet is used in a manner similar to that described in the treatment for endometritis. It should be done thoroughly to remove the hyper-

trophied mucous membrane. This removal of the hypertrophied tissue ruptures and scrapes away the diseased vessels, and is

Fig. 465.—Incision of Cervix to Expose Intra-uterine Myoma.

effective in the arrest of hemorrhage. It should be followed by careful irrigation of the cavity, and subsequently by painting

the canal with tincture of iodin or carbolic acid, or with a mixture of these two agents. When there is much hemorrhage, following the use of the curet, the uterus should be packed with iodoform gauze. Curetment of the uterus, while effective in decreasing the hemorrhage, is not unattended with danger. The injury to the surface of the tumor may cause an inflammation,

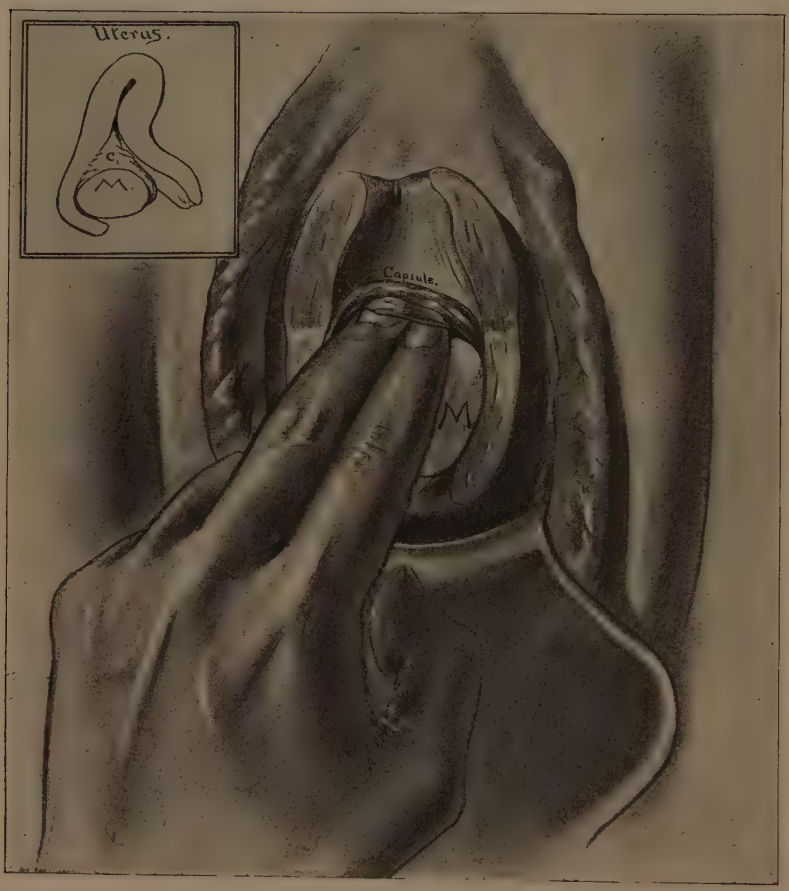


Fig. 466.—Cervix and Capsule Incised, the Latter Pushed Back.

which will interfere with its nutrition, and by the presence of germs which have been introduced during the procedure, may eventuate in suppuration and extensive necrosis. When the myomata project into the uterine canal, and the latter is irregular, difficulty is experienced in reaching all points of the canal with the curet, and the plan of treatment will not be effectual. In

small tumors that cause severe hemorrhage curetment is of no value, and nothing short of the removal of the tumor will be of service.

535. (2) **Incision of the Cervix.**—This procedure is another palliative measure (Fig. 465). It consists in making a bilateral or an antero-posterior incision through the cervix, which diminishes its resistance and facilitates the extrusion of the tumor. When the body of the uterus is well dilated by the growth, this procedure permits the tumor to be more rapidly extruded into the vagina, and it is thus rendered more accessible. It was formerly very generally practised as a preliminary to the administration of ergot, but not infrequently the rapid separation of the

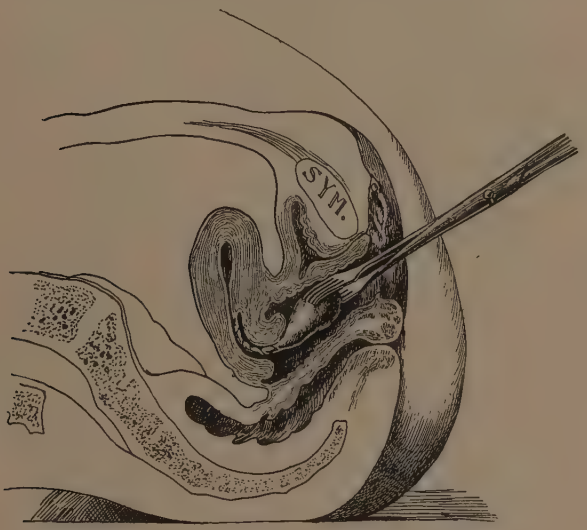


Fig. 467.—Removal of Myoma by Torsion of Its Pedicle.

tumor thus induced led to gangrene or necrosis of the growth and to fatal infection of the patient. Incision of the cervix will frequently prove of value as a first step in operative procedure for the removal of a growth.

536. (3) **Incision of the Capsule** (Fig. 466).—In sessile submucous or interstitial fibroids which project into the cavity of the uterus the more rapid expulsion of the tumor can be accomplished by incising the uterine surface of the tumor into and through its capsule. The incision is accomplished by wrapping the blade of the knife with adhesive plaster at a necessary distance from the point, as advocated by Atlee, or the thermocautery or galvanocautery knife can be employed. The wall is

pushed back and the tumor partly enucleated, which decreases the resistance. Subsequent contraction promotes the extrusion of the tumor into the uterine cavity and renders it a pedunculated growth. This operation, though apparently but a slight one, is not free from danger, for the rapid extrusion which follows its performance not infrequently causes loss of vitality of the tumor and degenerative processes which may be dangerous to the life of the patient. The operation is advisable only when it is employed as one of the preliminary stages to the removal of the growth. When such a procedure has been adopted, it is preferable that the tumor should be subjected to complete extirpation.

537. (4) **Removal of the Growth.**—(*a*) *Torsion.*—(Fig. 467.) When the growth is situated in the vagina, after having been

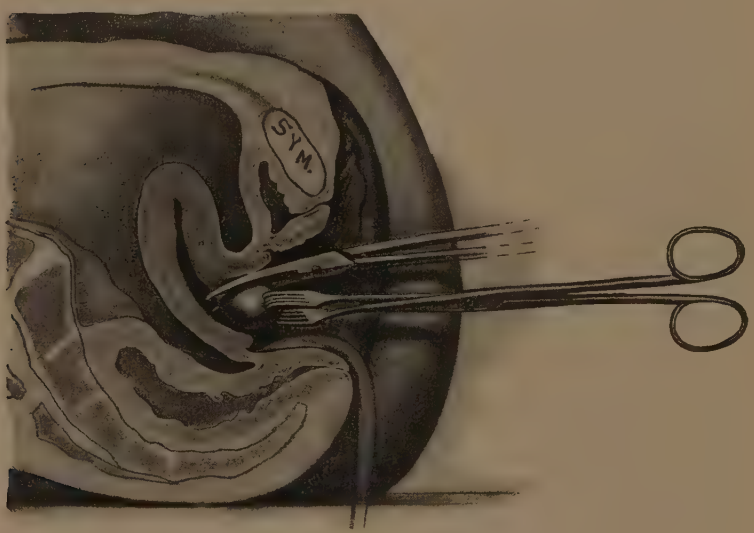


Fig. 468.—Incision of Pedicle of Myoma.

extruded from the cavity of the uterus, and hangs by a pedicle, it can very readily be removed by torsion. The technic of the procedure consists in placing the patient in the dorsal position and exposing the tumor (after thorough asepsis) with the Edebohls speculum or with retractors. The growth is seized with a strong vulsellum forceps, preferably four-bladed, and turned upon its axis until the pedicle of the tumor is twisted off. When the strong vulsellum forceps are not at hand, the same purpose can be accomplished by seizing the tumor upon opposite sides with double tenaculum and rotating it by traction with these

instruments. When the tumor has not been extruded from the cervix, the os can be enlarged by a bilateral incision until the intra-uterine tumor is exposed, when it can be removed, if the tumor is pedunculated, in the manner described.

(*b*) *Incision of the Pedicle.*—When the tumor has been extruded from the uterine cavity, it may be seized and dragged upon with a pair of forceps until the finger can be passed over it as a guide, when with a pair of scissors (Fig. 468) the pedicle

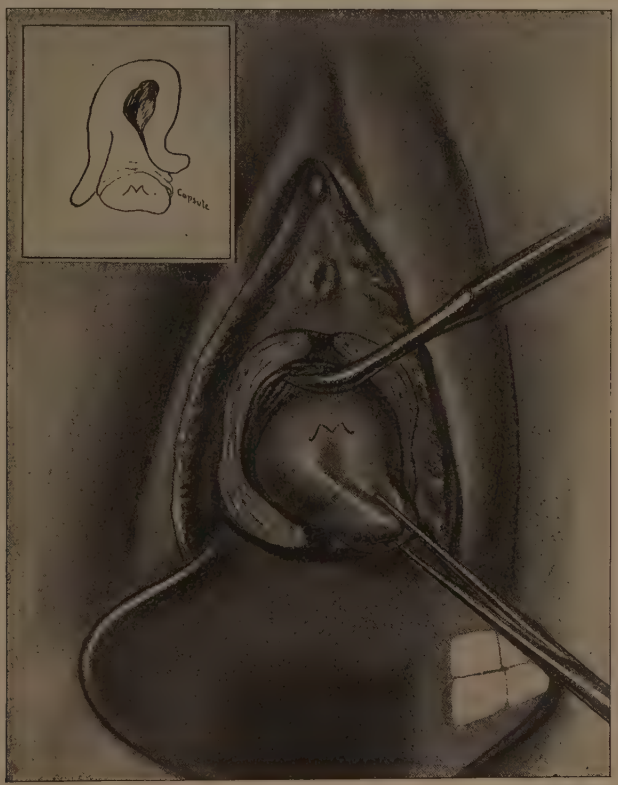


Fig. 469.—Enucleation of Tumor through the Vagina.

can be cut; or the intra-uterine tumor can be rendered accessible by dilatation with tents, or through bilateral incision of the cervix. The employment of the wire écraseur or the galvano-cautery wire is by some advocated for the cutting of the pedicle, but any hemorrhage likely to occur can be controlled by gauze packing, and the procedure, outside of the possibility of lessened danger from hemorrhage, affords no advantage which will com-

pensate for the extra loss of time. In all these operations rigid asepsis must be practised.

(*c*) *Enucleation.*—Enucleation was first practised upon submucous fibroid growths of the sessile variety. Here, when the uterus is dilated, or after its dilatation, the tumor is exposed, seized with a pair of forceps, drawn upon, and, with the finger or a blunt dissector, the attachment to the uterus is broken and the tumor removed. Thomas employed a serrated spoon which hugged closely to the surface of the tumor and pushed away the uterine wall (Fig. 469). This spoon, however, is not without danger in cases in which the uterine wall overlying the tumor is thin. The enucleation can be as readily accomplished with a blunt dissector. The tumor should be rolled about during the procedure so that the surface to be separated is constantly under observation. When the tumor for enucleation is within the body of the uterus, the finger should be used as a guide. Interstitial tumors may also be removed in a similar way. If necessary, the cervix as a preliminary may be split by a bilateral incision through the internal os. An interstitial tumor of the anterior wall may be made accessible by a vertical incision through the anterior lip until the base of the tumor is exposed, when it is seized and the tissue bluntly dissected away from it (Fig. 470). Occasionally, when the cervix is undilated and the tumor is in the anterior wall, it may be exposed by a transverse incision above the cervix, and subse-

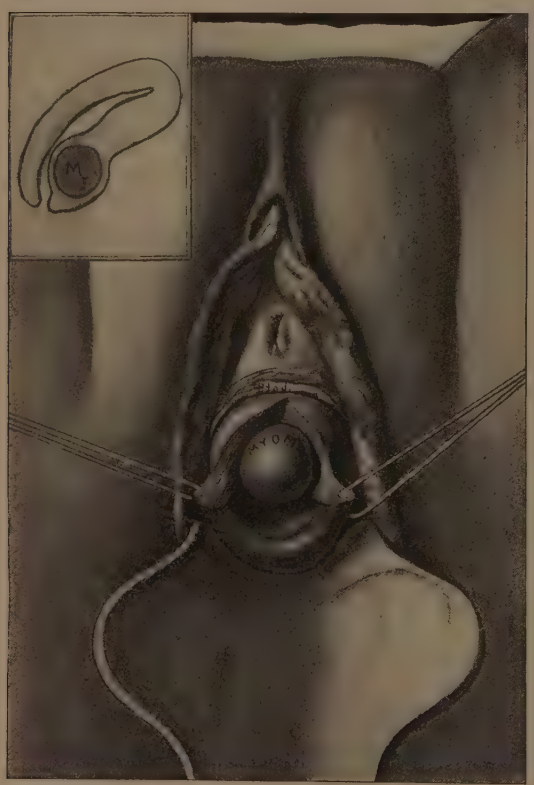


Fig. 470.—Interstitial Tumor Exposed by Vertical Incision of the Anterior Lip.

quently by a vertical cut at right angles to the former (Fig. 471); the flaps are turned back, after which the tumor is enucleated. When necessary, the bladder should be dissected from the ante-

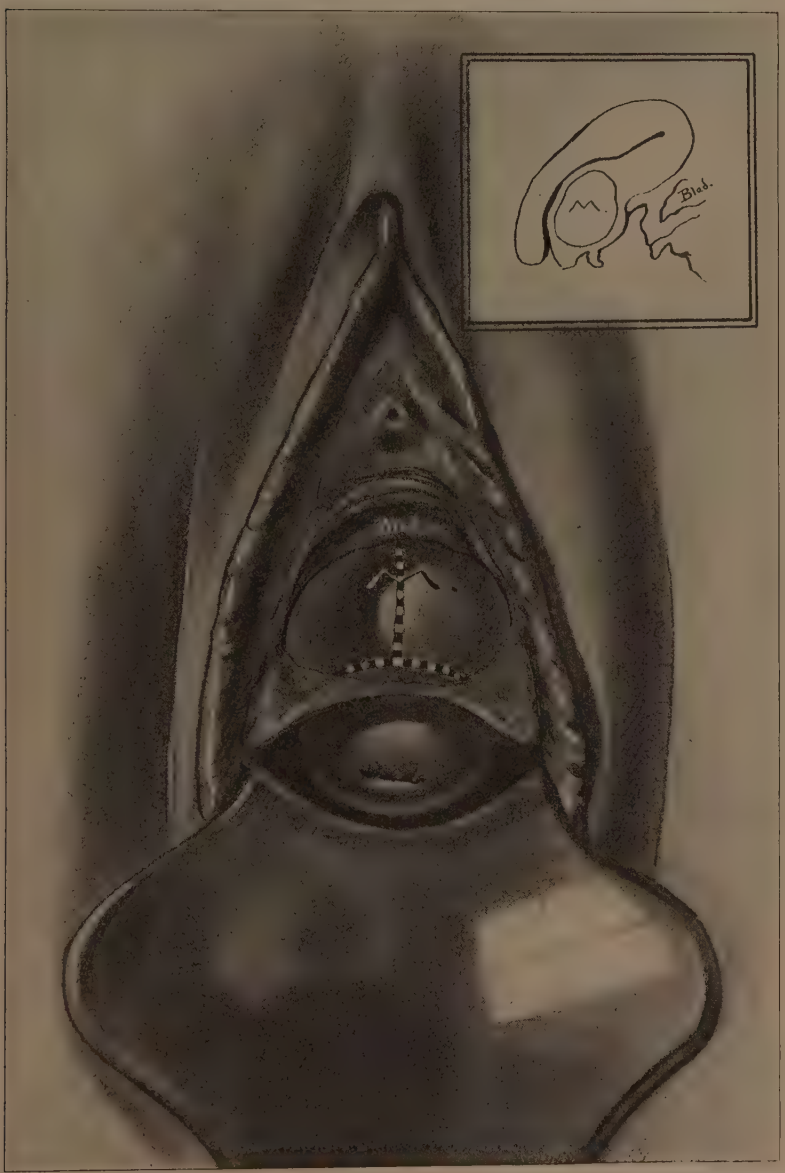


Fig. 471.—Myoma of Anterior Wall Exposed by Transverse and Vertical Incision.

rior surface of the uterus until the peritoneum is reached, and the latter can be opened. Retro-uterine tumors are made accessible through a posterior vaginal incision, which will permit the fundus to be rotated backward. Through this opening the enucleation is accomplished and the line of incision carefully closed by sutures before the organ is returned to its normal position (Fig. 472).

Fig. 472.—Myoma of Posterior Wall Exposed by Retro-uterine Incision.

(*d*) *Morcellement.*—Not infrequently, as we proceed in the enucleation of these growths, it will be found that a tumor is so large we are unable to complete our enucleation or to deliver the tumor through the vagina. In such cases the tumor may be reduced in size by the process described by the French as morcellement, which consists in cutting out sections of the mass with scissors or knife, and working up on one side until the tumor can be drawn down and the remaining portion completely enucleated. It frequently can be accomplished by dividing the tumor into halves, quartering it, or cutting off small sections of the accessible portions with scissors or knife until the entire mass is removed.

The principle of morcellement is applied to the removal of the uterus as well as to extirpation of morbid growths. The object is to insure the collapse of the organ until it can readily pass through the vagina. It consists in splitting the cervix by vertical incision, then removing wedge-shaped masses from each side. Avoid nearer approach than one-half inch to the lateral surfaces of the uterus. During the procedure the parts are made

tense by traction upon the mass with a double tenaculum (Fig. 473). Care must be exercised to secure a new grip upon the remaining portion before any piece is excised. Upon the completion of the delivery of the uterus, the hemostasis is accomplished as in hysterectomy, which will be described later. After the removal of the growth by enucleation, there will remain a considerable cavity, which is lined by tissue of low vitality. This should be thoroughly cleansed and loosely packed with iodoform gauze, and the patient watched that no renewal of

Fig. 473.—Removal of Myoma by Morcellement.

bleeding occurs. The gauze packing prevents the accumulation of blood in the uterine cavity, keeps the surfaces apart, promotes the sealing of the surfaces by plastic exudate, and, by its presence as a foreign body, favors contraction of the remaining portion of the uterus. At the end of three days the gauze should be removed, the cavity thoroughly irrigated, and the uterus repacked, or a drainage-tube should be inserted, through which irrigation can subsequently be practised. When the cervix has

been incised, the wound should be sutured as in an operation for lacerated cervix. All incisions, whether bilateral, through the anterior lip, or in the wall of the uterus, should be closed by suture.

538. (5) **Ligation of the Vessels.**—The usual observation that myomata decrease in size with the cessation of the periodic congestion of the uterus at the establishment of the menopause induced Gottschalk and Martin to endeavor to decrease the blood-supply to such growths and thus avoid the necessity for sacrificing the function of procreation. Gottschalk was the pioneer in vaginal operations for this special purpose. He limits the operation to extraperitoneal tumors, and in seven years found but twenty cases in which it was applicable. Of sixteen of these, which continued under observation, decrease in pain and hemorrhage was experienced by the majority. In a few the good results were delayed. The treatment is as follows: The patient is placed in the lithotomy position, the uterus explored, and any submucous myomata removed, followed by cureting as a routine measure. A circular incision in front of the cervix is prolonged as far as its posterior surface. The bladder is bluntly dissected from the uterus and broad ligaments and the vaginal mucosa loosened upon each side posterior to the broad ligament. The uterine artery and its branches are palpated and secured by three silk ligatures upon each side, which are cut short and buried by vaginal suture of the mucosa. The operation is followed by severe pains, and a few days later by a cast of the endometrium. In but three instances did the first menstruation occur at the normal period. Franklin Martin pursued the following course: With the patient in the lithotomy position he dilated, cureted, irrigated the uterus with 1 : 1000 bichlorid solution, and loosely packed it with iodoform gauze. He pulled the cervix to one side, made a lateral curvilinear incision over each uterine artery, and pulled the bladder away from the anterior surface of the broad ligaments for over two inches, while the latter were partially isolated upon their posterior surfaces. The vessels were recognized and guarded by the finger, a ligature was passed upon each side, and the ends were cut short. Care had to be exercised that a ureter was not included in the ligature. He advised that in large tumors the broad ligament should still further be spread out and the ovarian artery upon one side seized and ligated. The ligated tissue was buried by suturing the vaginal mucosa, and the vagina was loosely packed with iodoform gauze. Both the vaginal and uterine packing were removed at the end of two days and bichlorid douches were subsequently employed. This confines the future blood supply of the tumor to one ovarian artery. Martin found that this

plan of treatment resulted in arrest of hemorrhage and decrease in the size of the growth. The main objection to this plan of treatment is the possibility that in the ligation too much of the supply of blood may be cut off, and cause a loss of vitality and subsequent necrosis of the growth, which will greatly increase the danger to the patient.

539. (6) Hysterectomy.—Removal of the uterus with the offending growths can be done with advantage through the vagina when the latter is large and roomy and the uterus is not too large and freely movable. The operation should not be considered when the growth extends higher than midway to the umbilicus, or when the broad ligaments are occupied by growths. There are two principal methods of operating: (1) The removal of the uterus without section, and (2) division of the organ in order to reduce its bulk. The first procedure bears the name of Péan. His technic is as follows: The patient is placed in the lithotomy position, the cervix exposed with perineal and lateral retractors, seized with strong forceps, and a circular or oval incision carried through the vaginal mucosa nearer the os in front than behind. The finger or a blunt instrument separates the bladder from the uterus and broad ligaments. This procedure pushes the ureters out of the way. The posterior fornix, or Douglas' pouch, is opened in the same way. Freeing the uterus before and behind leaves it attached only by the broad ligaments. With the finger as a guide, a needle is made to transfix the broad ligament at about one-third its height and carry a ligature upon its withdrawal. The ligature is tied and the portion of structure under its control cut. Its repetition upon the opposite side permits the uterus to be drawn down, when the second series of sutures can be employed. This course soon permits the fundus to appear at the vulva, accompanied by the tubes and ovaries. When the uterus is removed, the ligatures upon both sides are left long, all bleeding vessels are secured, and the anterior and posterior flaps united by suture, securing them at either angle above the cut ends of the tubes, when the latter have been left. The ligatures are now cut short and the vagina loosely packed with gauze. By the second method, with section of the uterus, Landau, after exposing the cervix as described in the former operation, seizes it with a pair of vulsellum forceps at either angle of the os. The incisions of the vagina and of the bladder are accomplished as already described, when the anterior wall of the uterus is split in the median line with scissors, one blade of which enters the cervical canal, while steady traction is kept up upon the cervix. As the entire exposed surface is split, the finger is introduced and the bladder pushed away until

the fundus appears. A fresh grip of the forceps is taken upon the sides of the incision; the splitting may be carried over the fundus and down from the posterior surface until the uterus is divided into two portions. If the uterus is still too large for delivery, it can be still further divided or the growths may be enucleated. The broad ligament can be ligated from above downward or from below upward; clamps may be employed, though they are not secure. Schauta lost seven patients out of forty from the use of clamps. The most of the deaths were due to secondary hemorrhage following the removal of the clamps. The clamped portion of the ligament will become necrotic and may greatly delay convalescence. The wound is treated as in the previous procedure. Doyen modifies this operation by first opening the Douglas pouch and exploring the pelvic cavity. He next incises the anterior fornix, separates the bladder, and crushes the lower and middle third of the broad ligament with a special angiotribe. The uterus is drawn down, anterior hemisection is performed by a median or V-shaped incision, and the fundus is drawn downward and forward. Pressure forceps are then applied to each broad ligament and the uterus removed. The upper part of the ligaments is crushed and tied with a silk ligature in the groove made by the angiotribe. The remaining portion of the wound is closed with catgut sutures. Should the uterus be too large, it can be reduced in size by morcellement, described in Section 537. Bishop cites eight hundred and thirty-six cases of vaginal hysterectomy with twenty-nine deaths, a mortality of 3.4 per cent. Some operators pride themselves on being able to remove per vaginam growths which extend to the umbilicus, but such a course is attended with so much increase of danger as to render it an unjustifiable method of procedure.

Abdominal Route.

540. (7) Castration.—As early as 1872 Hegar advocated the removal of the ovaries to establish premature menopause in order to accomplish reduction in the size of fibroid growths. This procedure was devised in recognition of the fact that fibroid tumors decrease in size with the establishment of the climacteric. The operation consists in the removal of the ovaries and tubes or the performance of oophorectomy. It was found, however, that the removal of these organs was not infrequently attended with great difficulty, as the size of the growth led to a very vascular condition of the broad ligaments, and often the ovary was spread out upon the surface of the tumor, which rendered its enucleation and removal exceedingly difficult; sometimes the tumor rotated in such a way as to carry one ovary posterior, rendering it absolutely inaccessible without reduction of the size of the tumor.

Moreover, the ovary might be wedged between two multinodular growths, whence it could not be removed without injury to both. The procedure, unfortunately, was not always successful, as, indeed, many patients who were not victims of fibroid growth continued to menstruate or to have a bloody discharge subsequent to the removal of both ovaries. This is more probably due to the fact that the ovarian stroma extends along the course of the ovarian ligament, and the removal of the mass in the ordinary method of procedure did not remove the entire ovarian structure. So long as any portion of it remained, to mature and throw off ova, just so long would bleeding from the uterus occur. Tait advised the entire removal of the Fallopian tubes as a sure method of establishing the climacteric, attributing the influence dominating menstruation to these organs. The advantage of this suggestion doubtless was that the ligature was carried deeper and the ovarian artery ligated, which had escaped in a more superficial ligation. To insure the ligation of the artery it is generally recommended that the ligature should be placed sufficiently deep to include the round ligament. The advantage of castration is that in typical cases it can be done in a very few minutes, and with very slight danger; but, unfortunately, in large fibroid growths the ovaries are not always typically situated. In every such operation, then, the first consideration should be to examine carefully the situation of the ovaries and the relation to the growth, and see whether both can be thoroughly removed. The removal of one would be powerless to exercise any influence on the progress of the growth or the correction of its abnormal symptoms. Occasionally, the tumor causes torsion of the uterus by which one ovary is moved toward the front, and the other behind the tumor in such a situation that it can not be reached; or, as noted, the ovary can be so intimately connected with the surface of the tumor that any attempt to enucleate or remove it would be attended with more serious hemorrhage than would be occasioned by the removal of the growth. Another objection to the operation is that it does not always control the hemorrhage. In the performance of the operation it is absolutely necessary that every portion of both ovaries should be removed. The smallest amount of ovarian tissue remaining insures the continuation of the hemorrhage. When the fibroid is large, the entire removal is frequently attended with the greatest difficulty, as the adherent ovarian stroma can not be readily separated from the surface of the tumor. The operation is still further complicated by the existence of tubal diseases, such as pyosalpinx, in which extensive adhesions bind together the ovaries, tubes, and tumor in one mass, so that castration will be attended with greater obstacles and danger than would be the removal of the uterus and ovaries.

The operation should not be considered in cases of pure submucous myoma or in cystic degeneration of the fibroma. In pedunculated subserous and adherent tumors, and in very large interstitial growths, it is also contraindicated. In a freely movable uterus, in which the cervix can be readily reached, the operation affords no advantages over supravaginal amputation. Castration has a further disadvantage in not infrequently producing vasomotor symptoms, such as congestion, sweatings, hot flashes, pain in the head and sacrum. These symptoms are worse in the young than in those who are near the climacteric. Other symptoms are rather more rare, as, obstinate vertigo, profuse leukorrhea, cardialgia, and occasionally vicarious bleeding.

541. (8) Ligation of the Vessels.—The operation of castration having demonstrated the beneficial influence of ligation of the ovarian arteries, it was a very natural step to proceed to ligation of these vessels through the abdominal incision in preference to the more radical operations of partial or complete hysterectomy. Hofmeier reported a case of Schröder's in which extirpation of the myoma seemed impossible, and where, in order to decrease the size of the tumor, the lateral and median vessels of the ovary were tied, with good result. Antal, at an earlier date, after ligation of the vessels observed an atrophy of the ovary, and, in place of castration, thereafter incidentally employed the mere ligation of the vessels in order to affect the function of the ovaries. Rydygier tied all six uterine arteries of a patient on the 27th of June, 1889. The spermatic arteries were ligated; then, after splitting the peritoneum near the cervix uteri, the uterine arteries were tied; and, finally, a ligature was placed about each round ligament. At the end of four months the tumor had decreased to three-fourths its former circumference; but after a year hemorrhage, which had completely ceased, reappeared in a stronger degree, and the patient perished from marked anemia before radical operation could be performed. Byron Robinson has advocated the ligation of both ovarian arteries and the upper part of the uterine artery at the side of the uterus. This procedure is more effective in the smaller growths, and where hemorrhage is a marked symptom.

542. (9) Myomectomy.—In more or less pedunculated subperitoneal fibroids there should be no question as to the advisability of myomectomy. The operation consists, when the pedicle is small, in cutting through it with scissors or knife and uniting the edges of the cut surface with sutures so deeply placed as to make sufficient pressure to control the bleeding. (Fig. 474.) When the pedicle is not large, its peritoneal covering should be cut through by the circular incision, turned down like a cuff, and the base of the pedicle ligated with chromic catgut

and the tumor cut away, after which the peritoneal cuff can be united over the stump. In larger pedicles the operation consists in making peritoneal and muscle flaps, which can be brought together. In this way a single growth or a number of growths may be removed, leaving a normal uterus, and the ovaries and tubes undisturbed.

543. (10) **Enucleation.**—The ease with which smaller fibroid growths can be enucleated from their beds has led to the practice, by Martin and others, of shelling out interstitial fibroid growths from the uterine wall, leaving the uterus in place. (Fig. 475.) The procedure is performed as follows: The uterus is raised up, the position of the growths determined, and an incision made over the more prominent growth in a vertical direction in order to

Fig. 474.—Abdominal Myomectomy.

injure as few vessels as possible. The incision is made into the uterine wall and through the capsule, and the tumor is exposed. The tumor is then seized with a double tenaculum and drawn up, while with a blunt dissector the tissues are pushed off and the enucleation is accomplished. The removal of the tumor is followed by firmly packing a gauze pad into its cavity. If large vessels bleed, these should be seized and controlled with pressure forceps. The wall is still further investigated, and, when possible, other fibroid growths situated within it should be brought through the first incision. This, in some cases, however, may involve more extensive mutilation of the uterus than would a separate incision over the mass.

The advocates of this procedure generally limit it to the cases in which but a few growths are found in the uterine wall, and it was formerly particularly directed that the uterine cavity should not be opened. When we consider the investigations, however, of Menge and Krönig, which demonstrate that the uterine cavity is free from pathogenic germs, there should be no hesitancy in opening it, if necessary, to remove growths. In one patient I thus enucleated thirteen fibroids from the wall of the uterus, five of which were removed from the uterine cavity. After the operation the patient recovered without a single abnormal symptom. From another woman nine growths were removed. In another woman (unmarried) twenty growths were enucleated. What remained of the uterus was pretty well riddled, but it

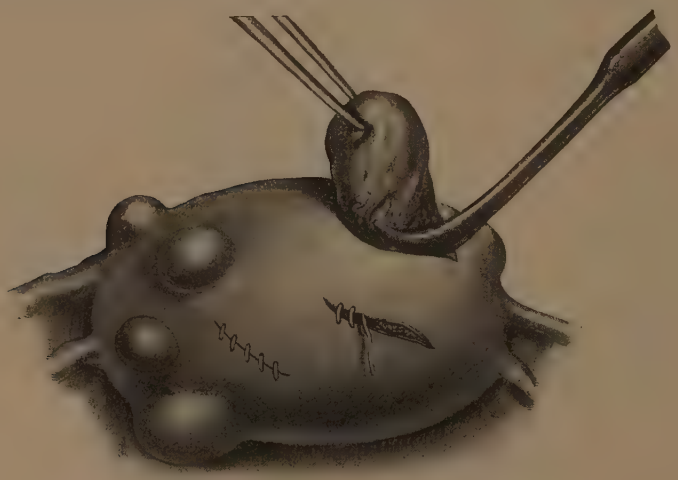


Fig. 475.—Abdominal Enucleation of Myomata and Method of Closing the Uterine Wound.

was sutured together and the patient completely recovered. In an unmarried woman nine growths were removed, five of them from the anterior wall. The loose tissue, being of low vitality, subsequently became necrotic, and in the sixth week after the operation this was withdrawn through a sinus in the abdominal wound; convalescence subsequently was rapid. From an unmarried woman, a fibroid, which projected into the cavity of the uterus and had filled it up so that the tumor could be touched through the cervix, was enucleated through the abdominal cavity by posterior uterine incision. A gauze drain was passed through the cervix and the uterus closed over it. The patient recovered.

After the enucleation of growths the wounds in the uterus should be carefully sutured by deep and superficial layers of chromicized catgut, exercising the precaution to include and secure with the suture any large vessels in the wall which may bleed, and by the superficial suture to bring a good portion of the peritoneal surface of the uterus in apposition. Before the abdomen is closed all the wounds must be thoroughly inspected to see that hemorrhage is completely controlled. Should there be a tendency to excessive bleeding, it would be better to ligate the ovarian arteries as an additional safeguard. This operation is not suitable for very large growths in which the uterus is very extensively mutilated, or where the tumors are situated laterally and involve to a greater or less degree the Fallopian tube. In enucleation of intraligamentary growths the broad ligament is split, in order to expose the growth. In these cases care must be exercised that the ureter has not been displaced upward by the tumor. It is important, also, to avoid injury to the ureter or its ligation in the subsequent closing of the broad ligament.

544. (11) **Partial Hysterectomy, or Supravaginal Amputation of the Uterus.**—This was the earliest abdominal operation performed for the removal of myomatous growths, and the earlier operations were cases of mistaken diagnosis, the procedure having been undertaken for the removal of ovarian tumors. The first deliberate operation seems to have been performed by Burnham, of Lowell, in 1853, in which the patient recovered. A large proportion of the earlier operations were unsuccessful; the difficulty in controlling hemorrhage from the elastic stump rendered its intraperitoneal treatment exceedingly dangerous, so that the procedure was practised of treating the stump extraperitoneally. The first to form a systematic method of operation was Koberle, of Strasburg. The method of performing the operation was as follows: The patient was placed in the dorsal position, and a long abdominal incision made in the median line, through which the uterus and tumors were delivered. The peritoneum above the bladder was incised and the latter stripped down, an elastic ligature or serrenœud was placed about the cervix as low as possible, and pins were passed through it above the serrenœud. The uterus and tumors were cut away sufficiently above the pins to prevent the traction of the stump from the grip of the instrument, the abdominal wound was closed down to the stump, while the latter was subjected to cauterization, and an application of persulphate of iron or tannin made to its raw surface to secure mummification. By some operators the parietal peritoneum was fastened to the peritoneal covering of the stump by a continuous catgut suture. This procedure was done to promote

the rapid union of the peritoneal surfaces and thus preclude the possibility of the discharges from the sloughing stump gravitating back into the peritoneal cavity.

Occasionally, under this plan of treatment, the stump would become dry and gradually be thrown off without suppuration. It resulted, however, in an excavation, by the retraction of the stump, which had to close by a process of granulation, making convalescence prolonged. Often it was difficult to prevent the putrefactive changes taking place and resulting suppuration. The weakened abdomen favored the subsequent development of ventral hernia. Weill gives the mortality in three hundred and ninety-two cases as 18.6 per cent. Hauck's latest list of three hundred and eight cases gives a mortality of 8.7 per cent. The difficulty in maintaining asepsis, the delayed convalescence, the weakened abdominal wall, led to the study of methods by which the stump could be treated within the peritoneal cavity. One of the earliest operators to attempt the intraperitoneal treatment was Schröder, who published in 1880 an account of his cases. He opened the abdomen by a median incision, ligated that portion of the broad ligament containing the spermatic arteries with two ligatures, and cut between them. A similar course was pursued with the round ligaments. The stump, consisting of the cervix, was constricted by a rubber ligature, the mass cut away above the ligature, the stump caught with the vulsellum forceps before the division was completed, and the cervical cavity cauterized with a 10 per cent. solution of carbolic acid. The divided surfaces were united near to the mucous membrane with sutures; this covered with several rows of suture and, finally, the peritoneum was sutured over the stump, after which the rubber ligature was removed. He employed carbolized silk, and later juniper catgut, for sutures. Other operators have modified this procedure, as Zweifel, with partition ligature, and H. O. Marcy, with cobbler suture. Gow makes the following modifications: After delivery of the tumor through a median abdominal incision, he ligates each round ligament on a level with the internal os, marks out an anterior peritoneal flap, and divides the round ligament and the anterior portion of the broad ligament between the uterus and the ligatures with scissors, carrying the incision toward the middle of the Fallopian tubes. The anterior flap is stripped down, the ovarian vessels and the Fallopian tubes enucleated and tied so that at least one ovary is left. The broad ligaments are divided on the uterine side of the ligature, and bleeding from vessels connected with this portion may be temporarily controlled by clamps. He then marks out a posterior flap and dissects it downward for a short distance, seizes the uterine arteries with pressure forceps at the level of the os inter-

num, cuts the tumor away with a knife, seizes and draws up the stump with vulsellum forceps, ties the uterine arteries, inserts a precautionary ligature by thrusting needles armed with silk through the stump from before backward, avoiding the peritoneum, so as to include the outer portion of the stump. This, done upon both sides, controls oozing or spurting from vessels which may have been given off obliquely. The bleeding area may also be encircled with a ligature passed by a Hagedorn needle. Two antero-posterior sutures are introduced through the muscular surface of the stump, avoiding the peritoneum, the raw surfaces, as a rule, are sewed together, the peritoneal flaps united, the peritoneum cleansed, and the abdomen closed. Baer modifies this operation. His course is as follows: The patient is placed in the Trendelenburg posture, and after separation of the adhesions the tumor and uterus are delivered through an abdominal incision, gauze is placed front and back, each broad ligament is transfixed by a single silk ligature, which, when tied, controls the ovarian arteries and veins. The ligated parts are then severed external to the tube and ovary, incision being carried close to the cervix. The peritoneal reflection anterior to the uterus is cut through with scissors, the bladder stripped down with the handle of the scalpel, the uterine artery tied close to the cervix on each side, and the cervix amputated just above the vaginal attachment. A small posterior fold is formed by stripping up the peritoneum while the amputation is made. The stump is now held in the grasp of tenaculum forceps. When the main arterial branches have been properly ligated, the raw end of the cervix will remain dry (Fig. 476). When all bleeding has been controlled, the peritoneal folds are loosely adjusted over the stump with Lembert sutures and the abdominal incision is closed (Fig. 477). Difficulties have occasionally been found in this operation from pus or exudates forming above the stump beneath the peritoneal covering (Fig. 478). Le Bec, after abdominal section, draws out the uterus and fibroids, ligates the broad ligament with a double ligature and severs it between the ligatures. The round ligaments are ligated separately and the bladder with the peritoneal flap dissected down into the vagina. The tumor may be decreased in size by throwing a rubber ligature around the cervix and cutting away the mass above, or the tumor can be drawn over the pubes, a long curved forceps inserted into the vagina so that, when opened two or three centimeters, the posterior fornix is stretched. A small incision is made into the pouch of Douglas, and widened by opening the forceps. The tumor is drawn back and forceps are introduced so as to protrude against the anterior fornix, when the latter is treated in the same way. Care must be exercised,

however, not to rotate the tumor to one side and thus injure the large uterine veins. One end of a long silk thread is seized by forceps, carried into the vagina, and brought up again through the opening in Douglas' pouch. Another thread is similarly applied on the opposite side. Both are tied, thus controlling the uterine arteries. The tumor is removed horizontally just above the ligatures, and only leaves a pedicle. This pedicle is split in the median line and as much cut away from each side as

Fig. 476.—Supravaginal Removal of Myomatous Uterus.

possible, only leaving sufficient to hold the ligatures. The long ends of these are seized with the forceps and drawn downward, the peritoneal flaps sutured together with catgut, and the abdomen closed. The Pryor-Kelly modification of the operation consists in the ligation of the ovarian vessel and round ligament and the division of the ligament upon one side. An anterior peritoneal flap is formed and the peritoneum and bladder stripped down. This exposes the uterine artery and veins, which are

ligated by a ligature carried with a curved needle beneath them close to the side of the uterus, the organ is drawn to the opposite side, and the uterine vessels are divided. The uterus is cut across just above the vaginal junction. A pad of gauze is placed beneath the upper cut surface to prevent the intrauterine discharges from escaping on to the wound while the canal below is wiped out. When near the opposite edge of the cervix, the incision is carried up one to two centimeters so as to leave a thin shell of cervical tissue and to expose the uterine vessels at a higher level, where they can be more easily tied and with

Fig. 477.—Cervix Cut Across Preliminary to the Complete Ligation of One Ligament.

less risk of including the ureter. The uterine vessels are clamped and divided, the uterus is rolled still further over, the round ligament clamped and cut through. With still more traction, the ovarian vessels come into view, when they are clamped and cut and the whole mass becomes free. All clamped vessels are then tied. Kelly ties all important vessels twice, once during the enucleation and again after it is completed. After control of the hemorrhage, the stump is closed over the cervical canal by three to five catgut sutures. These sutures do not include the mucous

membrane, the anterior peritoneal flap is drawn over the stump and united by continuous catgut suture to the posterior peritoneum. Where a large space has been left in the cellular tissue, it is advisable to unite the peritoneum with interrupted or mattress sutures, so that blood can run into the peritoneum and be absorbed instead of forming a hematocele. Bishop modifies the operation by removing the cervix entire. When the broad ligament is ligated, having reached the stage of ligation of the uterine artery upon one side, instead of cutting across the cervix he has an assistant push up the lateral culdesac of the vagina and cuts down upon it, and thus enters the vagina. With the scissors the vaginal wall is then cut through entirely around the cervix, which is bodily lifted up with the rest of the uterus and

Fig. 478.—Stump Covered with Peritoneum.

rolled over toward the opposite side. The cervix is seized with strong forceps and pulled up against the free surface of the uterus. It has been previously plugged and, consequently, gives no trouble from the discharges. This procedure affords a ready method of enucleating intraligamentary fibroids, especially if they are situated upon one side of the abdomen. The entire removal of the uterus has another advantage, that there is no obstacle to drainage from the pelvis. He draws down into the wound a roll of iodoform gauze and closes the peritoneum over it. The abdomen is closed without drainage. E. C. Dudley claims that the union of the peritoneal flaps by transverse sutures permits the pelvic floor to sag down. Therefore he advocates the union of these surfaces by an antero-posterior line of suture. Where the cervix is left, a flap is made on each side. These

are united, and over them the peritoneal flaps are drawn and secured by an antero-posterior line of sutures. The operative procedure just described affords a ready method for dealing with those intraligamentary tumors which occupy only one side of the pelvis, but where we have the uterus filled up with fibroid growths and extending into the broad ligaments upon both sides, and we can not reach Douglas' pouch posteriorly, the problem for removal seems a most complicated one. The operation in these cases, however, can be very expeditiously performed by making a vertical section through the uterus and tumor from the fundus downward, dragging the masses to either side as the incision is made. The intestines, of course, are held back by gauze introduced behind the tumor, while the bladder is rendered visible as we proceed in the division. In this way the entire uterus may be split down to and through the cervix, or, if preferred, each side may be cut through at the vagino-uterine junction, leaving the cervix as a simple stump. As the lower portion is drawn upward, the uterine artery becomes visible. This is secured with clamp forceps. Further traction upon the mass rolls out the fibroid growths from the broad ligaments, and later renders visible the ovarian artery, which is also secured. The broad ligament is clamped external to the ovary and tube, and the mass removed. A similar course upon the opposite side leaves us with the uterine and ovarian vessels clamped ready for the application of the ligature.

The remaining steps of the operation may be completed as described in the previous operative procedures.

545. (12) **Panhysterectomy,** or total extirpation of the uterus, is a preferable procedure in those cases in which the cervix has been largely taken up by the extension of the growth, or when it has undergone extensive disease. This operation may be performed by a number of methods:

I. *The method of A. Martin*, of Berlin: With the patient in the dorsal position, through a large median incision the tumor is drawn out, and, if necessary, can be made more movable by the enucleation of masses after the capsule has been split. The infundibulopelvic ligament is ligated and the broad ligament divided until the cervix is reached, beginning usually upon the left side, but in all cases on that in which the procedure would be most complicated. Having completed ligating one side before attacking the other, a pair of clamp forceps is applied on the uterine side of the line of ligature. The broad ligament is then divided between the forceps and ligatures to the cervix. The uterus can then be brought over the symphysis pubis, the posterior fornix is cut through by scissors, close to the cervix, and the two edges of the wound united by sutures. Sometimes bent

forceps are passed and from the vagina made to tear through the posterior fornix into Douglas' pouch, and by separating the blades the structures are torn with less danger of bleeding. A ligature is passed around the lower attachment of the broad ligament on the one side, which is then divided. The os is seized with a pair of forceps, which both closes the cervical canal and draws the cervix upward and backward into the peritoneal cavity. The other side of the broad ligament can now be secured in a similar manner. The anterior vaginal fornix is then divided and the firmer bands of connective tissue will meet in this situation. When these are cut through, the cervix separates easily from the bladder. Bleeding vessels are secured with the ends of the ligatures drawn down into the vagina. The peritoneum is united by transverse sutures over the vaginal wound and the abdominal wound closed without drainage.

II. *The Method of Christopher Martin*, of Birmingham: With the patient in the dorsal position, he delivers the tumor through a median incision and packs gauze pads above and below. A double thread is passed through the broad ligament at the junction of its upper and middle thirds, and midway between the uterus and pelvic wall. These two sutures do not interlock. By pulling them forcibly inward and outward, the punctured aperture is torn with a transverse slit and the two ligatures are tied as far apart as possible and the intervening broad ligament divided. The same process is repeated on the opposite side. He prefers, where possible, to leave one ovary and tube. The other is removed with the uterus. A second ligature is passed through the broad ligament about the level of the internal os and nearer to the uterus than the first one. The aperture puncture is again stretched, when the ligature is tied as far apart as possible and the intervening tissue divided. The bladder is then separated from the anterior surface. He also advises the use of the sound in the bladder, to define its upper edge. A curved incision, two-thirds of an inch from the upper edge of the bladder, is made from one broad ligament to the other, and the bladder is stripped down. The surgeon can determine when he has reached the vagina by following the tip of a pair of forceps pressed into the anterior fornix. The vagina is opened upon these with scissors and the opening enlarged. The posterior fornix is similarly treated. The ureters, when seen, are pressed outward. The uterine arteries now remain to be tied. Ligatures are passed through the remaining portion of the broad ligament, hugging close to the mucous membrane of the lateral fornix of the vagina, and are tied upon either side. The uterus is then cut loose, keeping the scissors as far as possible from the two lower sutures. The cut edges of the vaginal walls are drawn

upward with forceps and carefully inspected. All blood-clots are sponged out of the pelvis and all bleeding points ligated. The ligatures may be cut short or may be left long, the ends being used to draw the stumps into the vagina. The vaginal wound is not closed, but is filled with a thick roll of iodoform gauze drawn through into the vagina. The abdomen is closed by interrupted silkworm-gut sutures. The gauze placed in the vagina is removed on the fifth or sixth day.

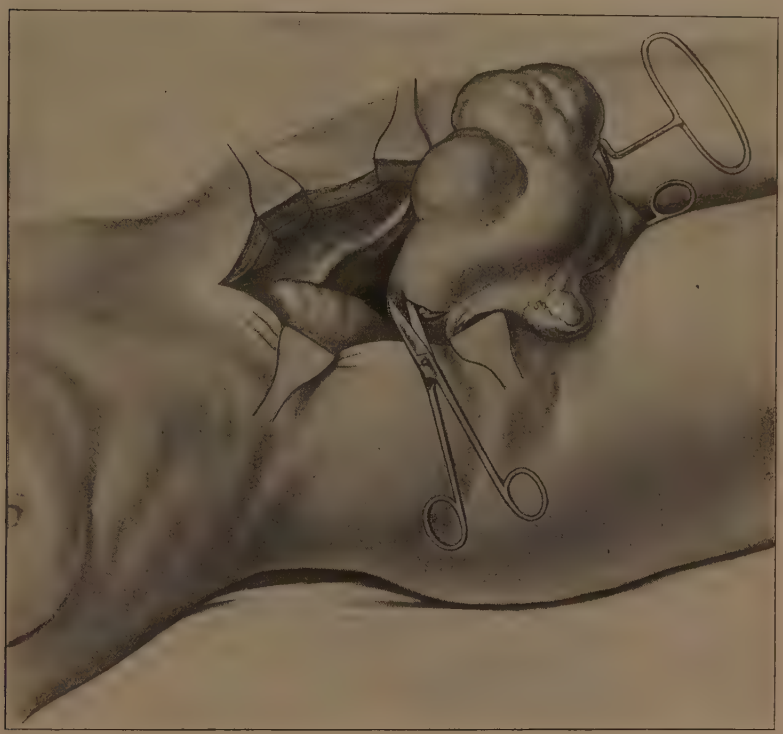


Fig. 479.—Panhysterectomy. Doyen's Method. The tumor rolled out, incision made from Douglas' pouch into the vagina upon the end of a pair of forceps.

III. *Doyen's method:* With the patient in the Trendelenburg posture, the tumor is lifted out through an abdominal incision and drawn forward over the pubes. A long, curved forceps, previously passed into the vagina, is made to project into Douglas' pouch, upon which an opening is made into the vaginal canal. Through this opening the cervix is seized by the anterior lip, if possible, and drawn upward and backward (Fig. 479).

While held in this position, the entire circumference of the attachment of the vagina to the cervix is under view and can be divided all around by scissors (Fig. 480). The cervix is separated from the bladder by traction upward until the peritoneum above the bladder is reached, which is broken through and stretched back. The broad ligament external to the ovary and tube on the right side is clamped and incised with scissors. Clamp forceps are then applied to the broad ligament of the opposite side, when it likewise is cut through external to the ovary and tube. Frequently, by this method of procedure, the uterine arteries are not injured. The division is so close to the cervix that the main

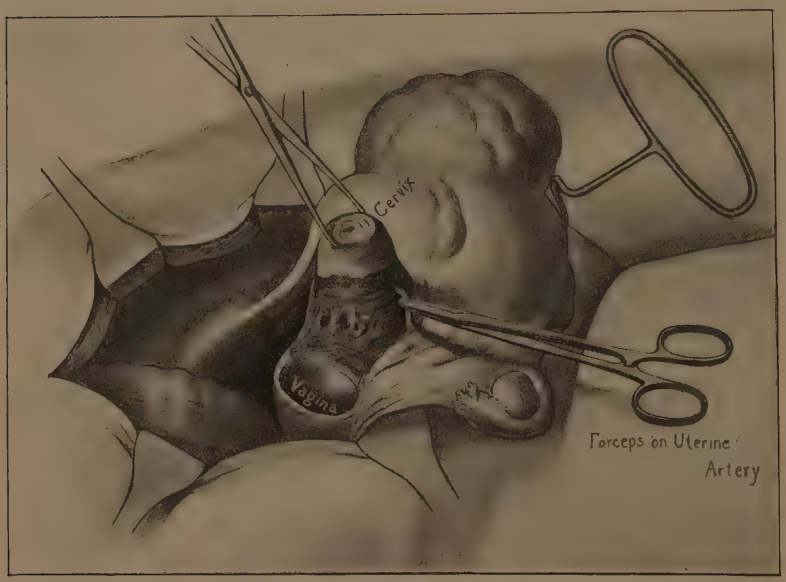


Fig. 480.—Cervix Separated from the Vagina, and Being Pulled Away from the Bladder and Ureters.

branch is not divided, and it is only the smaller branches that are torn, and consequently do not bleed. The pedicles of the broad ligaments are crushed with the angiotribe and ligated in the groove. The uterine arteries are also ligated and forceps removed. The vaginal mucous membrane can be united by two or three sutures with the peritoneum. The ends of the ligatures on the arteries are drawn down into the vagina, and the pelvic peritoneum is united by a purse-string suture across the pelvis, so as to invert the stump of the broad ligament below this structure. The abdominal wound is closed without drainage.

Doyen, in his earlier operations, trusted to the angiotribe alone, but later applied a catgut ligature in the groove. This procedure is preferable.

IV. *Schauta's method:* The tumor and uterus are drawn out through a median incision and the broad ligament on each side divided between clamp forceps. The anterior peritoneum is divided and, with the bladder, stripped down to the vagina, the tissues are clamped upon each side and the vagina opened right and left between the clamps and the uterus. The tumor is now held by the anterior and posterior vaginal walls, which are secured by curved clamps, and the uterus removed. Ligatures are substituted for the clamps, which are left long and employed for vaginal drainage. The abdominal cavity is closed by union of the peritoneal folds over the vagina.

V. *Richelot,* through an abdominal incision, first separates the anterior peritoneal fold and bladder. The uterine arteries are found, clamped by forceps, and cut close to the uterus. The anterior culdesac is found and opened; the cervix seized and drawn upward and forward. The cervix is separated from the vagina by a circular incision and the broad ligaments are separated in sections from below upward. This plan affords an effective procedure when there are extensive adhesions following disease of the appendages. All the clamped vessels are securely ligated and the vaginal wound is closed with catgut.

In difficult cases, Bishop employs what he calls the combined method, which may be begun either from below or from above. In the former, the patient is placed in the lithotomy position, the uterus exposed by retractors, seized and drawn down with vulsellum forceps. The cervix is cleansed, packed with gauze, and if there is much discharge, the os is closed by a suture. A circular or ovoid incision is then carried around the cervix, completely dividing the vagina, when, with the finger hooked closely to the uterus, the bladder is separated from the anterior surface of the uterus and well to either side. In large tumors this can not be accomplished to a great extent, but should be sufficiently to expose the uterine vessels. Douglas' pouch is opened, and, with the one finger behind and the thumb in front, the uterine artery should be defined, ligated, and the ligament cut as far as the ligation extends. Hemorrhage is carefully controlled and the vagina loosely packed with gauze. The patient is then changed to the Trendelenburg posture and the abdomen opened through the rectus sheath of one side. All adhesions to omentum and intestine are separated, and, where indicated, ligatures applied. A gauze pad is placed over the intestine. When the ovaries and tubes are healthy, they are to be left. When diseased, part of the ovary at least is retained. One

ligature is made to embrace the ovarian ligament, if the tube and the round ligament near the appendages are healthy enough to permit of their being retained, and is tied as near to the uterus as the retention of the ligature will permit. The ligament is cut close to the side of the uterus. The lateral incisions are joined by a curved incision anterior to the uterus, about half an inch above the line of the bladder, which is stripped down until the previous separation has been reached. The uterus is now attached only by the central portion of the broad ligament upon each side, which is ligated and the uterus cut away. Bleeding vessels are ligated and the ligatures cut short, the pelvis dried, a roll of gauze pulled through into the vagina, and the peritoneal flaps closed over it with a continuous catgut suture. All raw edges are carefully inverted into the vagina, so that the peritoneal wound is perfectly smooth. Bishop closes the abdominal wound with catgut for the peritoneum, *crin de Florence* for the aponeurosis, and horsehair for the skin. With the insertion of the last layer, the skin should be cleansed, dried, and painted with celluloidin, which forms an air-tight covering.

Bouilly preferred to begin from above and finish from below. He delivers the tumor through the median abdominal incision with the patient in the Trendelenburg posture, divides the broad ligament between double ligatures, incises the peritoneum in front of the uterus and pushes down the flap with the bladder, ligates the broad ligament so as to include the uterine arteries, amputates through the cervix, and closes the abdomen. Then, with the patient in the lithotomy position, he removes the cervix per vaginam, sutures the peritoneal flaps from below, and plugs the vagina with gauze. This procedure is particularly valuable in a sloughing fibroid which communicates with the vagina.

546. Summary.—An effort has been made to present to the student a résumé of the various procedures for the treatment of myomatous growths of the uterus. It is recognized, however, that when he comes to treat a case, he may be doubtful as to which method will be applicable to it. I feel it but proper to indicate what I believe to be the most justifiable methods of procedure. In submucous growths in which hemorrhage is a marked factor, the tumor, when accessible, should be removed by torsion or excision of the pedicle. If the tumor is still within the cavity of the uterus, the cervix may be dilated with laminaria tents, and, if sufficient room is not thus secured, the os can be split by a lateral or an anterior incision, as may be most convenient, and the tumor removed by torsion, by excision of its pedicle, or by enucleation. If the tumor is too large to permit of its ready extirpation, it should be removed by mor-

cellation. Vaginal hysterectomy should be confined to growths which are not too large to permit of their ready passage through the vagina, and yet in which the uterine structure is so taken up and involved as to preclude the retention of the healthy uterus, or in which the ovaries and tubes are secondarily involved, precluding the retention of the myomatous uterus. Of the abdominal operations named, myomectomy, enucleation of the growth, or partial or complete hysterectomy, can be performed. The principle here should be that no organ should be sacrificed the function of which can be maintained, so that when the ovaries and tubes are in such a condition as to justify the retention of the uterus, myomectomy or enucleation should be practised, even though a number of fibroid growths are present. When the uterine structure is much involved, or if ovarian, uterine, or tubal disease complicates the condition, we are forced to resort to either partial or the complete hysterectomy. My experience inclines me to advise complete hysterectomy, for the retention of the cervix affords no special advantage. Its complete removal does not add to the difficulty nor prolong the operation. It affords better drainage and expedites the recovery of the patient. No one operation is applicable to every patient. In the majority of cases, the Doyen operation is the most satisfactory. When the broad ligaments are shortened by inflammation and the pelvis filled up by myomata, the operator may be unable to reach the cervix from behind. Then, of course, another method of procedure must be chosen. The uterus containing the growths may be divided by a vertical section, enucleating portions of the tumor mass, thus decreasing the size of the uterus and affording more room for work. Proceeding from below upward, intraligamentary growths are shelled out without much danger to the ureters and afford better opportunity to secure hemostasis. Where access to one side of the pelvis is partially barred by inflammatory shortening or the ligament is occupied by myomata, the Bishop modification of the Pryor-Kelly operation permits ready removal of the uterus and growths.

547. Accidents during Operation.—Hemorrhage is an accident which is avoidable with careful application of ligatures. Where the tissues are ligated *en masse*, the angiotribe should be employed and the compression of the tissue followed by the application of a catgut ligature in the groove. The compression furnishes a button over which the ligature is unlikely to slip. When the cervix is retained, bleeding from the stump is avoided by applying ligatures upon each side to control the blood-supply from the uterine arteries. One advantage of the entire removal of the uterus is that hemorrhage, when it occurs, is at once revealed by its discharge from the vagina. Internal hemorrhage

will be indicated by symptoms of increasing shock, and the occurrence of such symptoms should be considered an indication for prompt reopening of the wound to secure the open vessel, for, should the patient rally from the hemorrhage, the large accumulation in contact with the intestine in the weak state of the patient endangers her subsequent course, from sepsis. All bleeding vessels should be firmly secured before the peritoneal wound is closed. Care must be exercised in short broad ligaments that the ovarian artery is not retracted behind the peritoneum from the grasp of the ligature, there to produce a concealed hemorrhage or thrombus which may become so large as to open into the peritoneal cavity.

Injuries to the Hollow Viscera.—In the injuries to the viscera the bladder is most likely to be affected, as it is closely attached to the anterior wall of the uterus and cervix. Its relations to the uterus and tumor will largely depend upon the situation of the growth. One which has originated in the lower part of the anterior wall of the uterus may very readily drag up the bladder, and cause it to be displaced upward. The bladder may be displaced to one side, and not cover the anterior surface of the uterus and tumor. This may readily occur because of partial torsion of the neck of the uterus or from the size of the growth. In one case I incised the bladder when it was displaced upward and to the left side, to form a quite distinct tumor that did not entirely disappear under the use of the catheter. The bladder was accidentally incised in opening the abdomen. It was immediately sutured, removed from the surface of the growth, and the patient recovered. Inflammatory adhesions may bind the bladder to the anterior surface of the tumor, and in the subsequent development may drag it so high that it is overlooked in the separation of adhesions. In such a way I was so unfortunate as to incise the fundus where adhesions were extensive, involving both anterior and posterior surfaces. In this patient recovery took place after the bladder wound was sutured. When the bladder is injured, the wound should be closed by sutures at once, whether it occurs upon the peritoneal or on the nonperitoneal surface. Precaution should be exercised in the use of the sutures that they do not include the vesical mucous surface. It is well to have a double row of sutures, in order to bring a larger surface of the bladder-wall in apposition, and in the subsequent convalescence the bladder should be frequently evacuated. When the wound has been extensive, it would be preferable to employ a permanent catheter for the first week, and for the second week to have the urine drawn at frequent intervals. The possibility of displacement of the

bladder by the growth should always be considered, and care should be exercised to avoid its injury.

Injuries of the Ureter.—The situation of the ureter alongside the cervix makes it particularly vulnerable in the removal of large fibroid growths, and particularly in those where the growth is developed low in the broad ligament, which, in some cases, shoves the ureter upward until we find it in the groove between the growth and the uterus. In such patients the dissection should be most carefully practised in order to avoid injury to the ureter. The Doyen operation lessens the danger to both bladder and ureter; the cervix is pulled away alike from the bladder and the ureters. In the intraligamentary variety the tumor is dragged away from its relations to the ureter. In case of injury, and particularly when the ureter has been cut, the proper procedure would be to bring about: *First*, the anastomosis between the ends of the divided ureter; the union can be end-to-end, the cut surfaces being made oblique. Another method is to close the vesical end and make an incision at a lower level in the wall, through which the renal end is introduced and secured by sutures (Fig. 221). *Second*, its transplantation into the bladder. In introducing the ureter, it is important that it should be anchored in the bladder in such a way as to prevent it slipping back or drawing away from its attachment to the bladder surface, which would permit the urine to escape into the peritoneal cavity (Fig. 220). If the union with the bladder is difficult, because the injury of the ureter is situated so high that the latter reaches the bladder only upon slight stretching, it is well to anchor the bladder at a higher level to the side of the pelvis, so that no traction shall be made upon the shortened ureter. In those cases in which we have a ureter too short to establish an anastomosis with the peritoneal end or transplantation into the bladder, the following alternative procedures have been suggested:

Third.—Carry the ureter across and anastomose it with the ureter on the opposite side. In a short ureter this may be attended with considerable difficulty. We should hesitate about imperiling the patient by disturbing the remaining conduit.

Fourth.—The introduction of the ureter into the corresponding colon. This operation has not been attended with very satisfactory results. The infection and gases from the intestine have been known to be carried into the ureter, to cause its infection as well as that of the pelvis of the kidney. The contact of the urine with the intestine is said to cause considerable irritation and to produce a marked diarrhea.

Fifth.—Bring the extremity of the ureter out through the abdominal wound or make a fistulous opening to the skin sur-

face. Such a procedure is attended with no little discomfort to the patient, as the constant soiling of the person and clothing with the urine is very distressing to a cleanly patient and annoying to those who have to be associated with her.

Sixth.—Ligate the ureter and drop it back. This ligation should be made by a double ligature, for the reason that, under the process of pressure-atrophy, the ligature becomes loosened and, when single ligatures are used, the urine escapes into the peritoneal cavity, and causes urinary infiltration and septic peritonitis. This condition is less likely to occur when a second ligature is applied from half an inch to an inch above the first. The urine continues to be secreted until the pressure within the cavity of the kidney is equal to the blood pressure, when the secretion is arrested. In such cases the kidney, unable longer to secrete the urine, becomes a useless organ and atrophies, while the extra work is taken up by the remaining kidney. The result of the procedure, of course, will depend, as it would in nephrectomy, upon the condition of the other kidney.

Seventh.—Removal of the kidney.

Intestinal Injuries.—Injuries of the intestine are less frequent. They may occur as a result of extension and firm adhesions to the surface of the growth. The injury is much more likely to take place in the sigmoid flexure of the descending colon and the rectum. As a result of chronic inflammation, the adhesions may be very extensive and firm, and lead to the injury of the intestine before its possibility could be suspected. In all cases of extensive adhesions, after the removal of the growth careful examination should be made to ascertain the possibility of intestinal injury. Such adhesions may also result from complications, such as suppurative disease of the tubes, associated with the growth. Very frequently an opening will result between a tubal abscess and a knuckle of intestine, through which its contents have been discharged. Recently, in removing a fibroid growth associated with pelvic suppuration I found an opening from a left tubo-ovarian sac in the anterior surface of the sigmoid flexure, into which the thumb could be introduced. Through this the abscess had partly emptied itself at intervals. In closing the wound care should be exercised to trim the edges of the opening, to remove the tissue that has low vitality or has been injured during the process, and to bring the surfaces together by a double row of sutures. Continuous chromicized catgut suture is a very serviceable one, but, as mentioned, the suture should be so introduced as to bring extensive surfaces in apposition. The patient should subsequently be kept upon an albuminous broth diet, and early evacuation of the bowels should be accomplished, afford-

ing no opportunity for hard fecal masses to form in this portion of the intestine. In closing the wound, in these fistulous cases, it is well that gauze packing should be applied and drainage practised, for it is always difficult to make certain that all the tissue of low vitality has been removed and that a fistulous opening may not recur. If the abdominal wound is closed, leakage may cause fatal infection of the peritoneal cavity before the gravity of the condition is recognized. If a small fistulous opening in such a patient occurs, it is preferable to keep the wound open and the cavity thoroughly cleaned by frequent irrigation, both by the rectum and the abdominal wound, and to permit nature an opportunity to close the opening by granulation. Nature soon shuts off the tract of the general peritoneum and prevents the possibility of its infection. To reopen such a wound in order to close the fistula increases the danger of general infection. Where the intestine is free and unobstructed, a fistula will close by granulation, but should the intestine be obstructed or kinked below, the latter will not close. The effect of a fistula will depend upon its size and position in the intestinal tract. Free discharge from the intestine high up means that much nutritive fluid is removed from the processes of absorption. Therefore, a corresponding loss of vitality results. A fistula in the large bowel, however, may exert but little influence upon the general nutrition.

548. Causes of Death Following Hysterectomy.—The most frequent causes of fatal results are hemorrhage, septicemia, and shock. Hemorrhage may be the cause of death shortly after the operation, from difficulty in controlling the bleeding during the procedure, although these cases must necessarily be rare; or it results from the subsequent slipping of a ligature from the pedicle mass. Unless the condition is recognized at once, the hemorrhage may be immediately fatal. If the enfeebled condition of the patient leads to formation of a clot and the arrest of bleeding, the large accumulation of blood in the peritoneal cavity may still be a source of danger to the patient, through its infection by its relation to the intestine or from pathogenic germs which may have been left in the pelvic cavity. In this sense it may furnish the cause for the subsequent death of the patient from septicemia. The danger from septicemia is greatly increased in those cases in which the operation has been difficult, owing to intraligamentary growths, when the tissues of the pelvis have been greatly torn during the progress of enucleation, or when the tumor is complicated by the presence of suppurative processes in the tubes, in the ovaries, or in the pelvis. Another prolific source of fatal result is shock. This may be incident to severe hemorrhage during the progress of

the operation; to a protracted operation on account of extensive adhesions, the growth being impacted in the pelvis, or from the previous enfeebled condition of the patient. We are not always able to account for the marked influence of shock. Occasionally, we will find the patient becoming greatly shocked almost before the operation is begun, as a result of the depressing influence of the anesthetic. This does not seem to be wholly dependent upon the condition of the circulation or of the renal secretion. Other and less frequent causes of fatal termination are embolism, ileus, and tetanus.

549. After-treatment.—The after-treatment of operations for the removal of fibroid growths does not differ in a marked degree from that of other abdominal operations. The greater injury and the corresponding amount of shock require, of course, more careful consideration and attention. When the patient has undergone extensive operation, much injury of the pelvis has occurred. If drainage is not practised, it is very desirable to place the patient in such a position as will promote the drainage from that portion of the pelvis most injured into the general peritoneum; so the foot of the bed should be elevated from six to eighteen inches. This decreases the activity of the circulation in the pelvis, prevents the accumulation of fluid in that portion of the peritoneum least able, from the injury, to take care of it, favors holding away the intestines from the injured surface, avoids unpleasant and unfortunate adhesions, and is capable of affording great comfort to the patient. If the patient has lost much blood and is greatly depressed, hypodermocleisis should be practised or intravenous injections of normal salt solution should be given. Hypodermic injections of strychnin, from $\frac{1}{30}$ to $\frac{1}{20}$ of a grain every two or four hours, of atropin, $\frac{1}{100}$ of a grain every twelve hours, and of digitalin, from $\frac{1}{8}$ to $\frac{1}{4}$ of a grain every eight to twelve hours, will be found of service. The patient should be wrapped in warm blankets and surrounded by hot-water bottles, accurately corked and well wrapped to prevent the possibility of burning. It should not be forgotten that the tissues of a patient profoundly shocked have greatly reduced resistance, and, hence, burn at a much lower temperature than would affect a healthy person. The nurse should be directed to frequently observe the position of the hot-water bottles about the patient, for fear that in her restlessness she may have brought the unprotected skin in contact with the devitalizing heat. Again, the heart's action and the tone of the blood-vessels can be greatly improved by the administration, hypodermically, of a 1 : 1000 solution of adrenalin chlorid, ten to fifteen drops every two to four hours. In greatly enfeebled and shocked patients the limbs should

be bandaged as far as the trunk to remove the blood from the less vital structures to the more important organs. Ice suppositories, consisting of pieces of ice some three inches in length, an inch or more in diameter, carefully smoothed and introduced into the bowel every hour, and enemata of strong coffee, normal salt solution, or whisky and peptonized milk may be given. Anodynes are contraindicated, and should be used only when the pain and distress or the nervous phenomena of the patient are so great as to render the unpleasant effects of morphin less injurious than these symptoms. The great thirst following the operation is overcome by rectal enemata. Nothing more than small quantities of hot water should be given by the mouth until nausea has been overcome. If, however, the patient continues to be nauseated for twenty-four hours, vomiting and retching small quantities of material, it is better to give a good draft of hot water to furnish the patient something upon which the stomach can contract. This acts as an irrigation to the stomach and decreases the distress. A Seidlitz powder serves well to wash out the stomach. Hare advises for this form of nausea the administration of acetanilid, gr. ij, and caffein citrate, gr. j, every hour until three doses have been taken. Benefit has also been found from small doses of cocain. I am very partial to tincture of nux vomica, gtt. ij every hour. Vomiting will frequently be allayed by giving the patient an enema of chloral, gr. xxx, in warm water, f℥ij. This brings about sleep and allays the nervous irritation. If the patient vomits continuously, regurgitating large quantities of dark greenish material, associated with more or less tympanites, the use of the stomach-pump is indicated; the stomach is washed out with a normal salt solution until the water returns clear. When the patient has had several days of this condition, follow the cleansing of the stomach with a hypodermic injection of morphin, gr. $\frac{1}{8}$ to $\frac{1}{4}$. Tympanites should be treated actively; if not relieved by irrigation of the stomach, give the patient an enema containing one ounce of powdered alum dissolved in a quart of warm water. This enema very actively promotes peristalsis. Keith advised:

℞. Quinin, ... gr. vj
Whisky, ... f℥ss
Water, ... ad f℥ij. M.
S.—To be used as an enema and repeated every hour for three doses.

It stimulates the nerve centers, produces increased peristalsis, and favors the expulsion of gas. When tympanites occurs the second day, in a patient who has otherwise been doing well, the following enema should be given:

℞. Magnesii sulph.,
Glycerin.,
Aqua, ... āā ℥j. M.

and later an enema of soapsuds, containing turpentine ℥j, beaten up with the yolks of two eggs and strained before being added to a quart of soapsuds. These measures failing, the patient should be given a hypodermic injection of strychnin every two or three hours, and repeat the irrigation of the intestine later. The patient should be placed upon her side, preferably the right, with the hips or the foot of the bed elevated, and a large quantity of a stimulating enema permitted to run into the bowel. Again, the enemas suggested may be supplemented by the administration of calomel, gr. $\frac{1}{4}$, every fifteen minutes, until two or three grains have been given, followed by:

℞. Magnesii sulph., ... ℥j
Acid. sulph. dilut. ..... f℥j
Syr. zingiber., ... f℥vj
Aq. cinnam., ... ad f℥iv. M.
S.—f℥ss every hour.

Generally, free evacuation of the bowels is sufficient to relieve the unpleasant symptoms, and the patient may then be gradually fed. When the nausea and vomiting persist for two, three, or more days, the abdomen becomes greatly distended, the patient weak and depressed, nothing should be given by the stomach, not even water. During this period rectal feeding should be practised. The stomach should be carefully irrigated with normal salt solution through a stomach-tube. She should be ordered three ounces of normal salt solution and one ounce of bovinine per rectum every four hours. Peristalsis should be overcome by hypodermic injections of morphin, beginning with gr. $\frac{1}{8}$ to $\frac{1}{4}$, and repeat in doses of gr. $\frac{1}{16}$ every three or four hours, until quiet is secured and maintained. In such cases, it is important that the sutures should be retained for a longer period. The long-continued disturbance interferes with the general nutrition and the processes of repair. The removal of the sutures early, or at the usual time, endangers the separation of the wound, because the processes of repair have been interrupted. In such a patient I removed the sutures on the eighth day, and the wound split open throughout its entire length as a result of a slight cough. Ordinarily, the sutures can be removed at the end of the eighth day. The patient should be confined to bed for fully three weeks, especially when a large incision has been made and the tumor was large. After the disturbance of the digestive tract has been overcome, the feeding should be generous, exercising care, however, to avoid indigestible food.

550. Puerperal Tumors.—Physometra.—An unusual form of enlargement of the uterus, giving the appearance of a tumor, results from the condition just named, which is an accumulation of gas in the interior of the uterine cavity. This affection may be produced during the puerperium or without it. After the woman is delivered the uterus is large and air will enter it. If expulsion is delayed by contraction of the organ, in the course of the convalescence the placental fragments or retained portions of membrane undergo decomposition, and produce a putrid gas, which, by larger accumulations in the organ, produces the condition known as physometra. It may develop in the nonpuerperal uterus, as is well indicated in the following patient, as cited by Auvard: A negress, forty-six years of age, reached the menopause and presented considerable abdominal enlargement. Her periods had not been seen for three months. According to her calculation, she was certainly pregnant. The term had passed four months; she called a physician and arranged that he should attend her in labor. Under an attentive examination of the patient to determine the cause of the uterine enlargement the hysterotome was introduced into the cavity of the uterus, when, in less than a minute's time, with great impetuosity, an offensive gas was driven out. After this evacuation the uterus returned to its normal proportions and the patient recovered. In the acceptance of this condition we must admit the possibility of the secretion of gas in the uterine cavity, or the putrefaction of retained intra-uterine debris, after the occlusion of the cervical canal. Decomposition of the debris results in the formation of gas and the distention of the organ. The treatment consists in the establishment of the permeability of the canal.

551. Hydrometra is due to any cause by which the internal orifice of the uterus becomes closed and the secretion retained in a woman who suffers from amenorrhea or in one suffering from endometritis after the climacteric has occurred. It practically produces a mucometra, or, when the liquid is serous and clear, it is denominated hydrometra—a term under which is included all seromucous uterine collections. If the endometritis is purulent, we have a pyometra. Hydrometra is exceedingly rare.

552. Hematometra is an accumulation of blood in the interior of the uterus, and has been described under malformations. A woman sixty years of age came under my observation with a history of having a very profuse offensive discharge. The discharge was so offensive that it was believed the condition must be malignant. The uterus, not very large, was removed, and upon careful examination it did not present the slightest

indication of the presence of malignant disease. The woman had been suffering from an endometritis, which had resulted in the production of large quantities of purulent fluid in the uterine cavity.

553. Hydatid Cysts of the Uterus.—The condition called hydatid cysts of the uterus is, however, free from the presence of hydatids. There are a large number of cysts, which form in the mucous membrane of the uterine cavity—a condition which generally follows labor or abortion, and is known as cystic mole. It is so closely associated with the condition known as deciduoma malignum that its consideration will be postponed until the discussion of the latter disease.

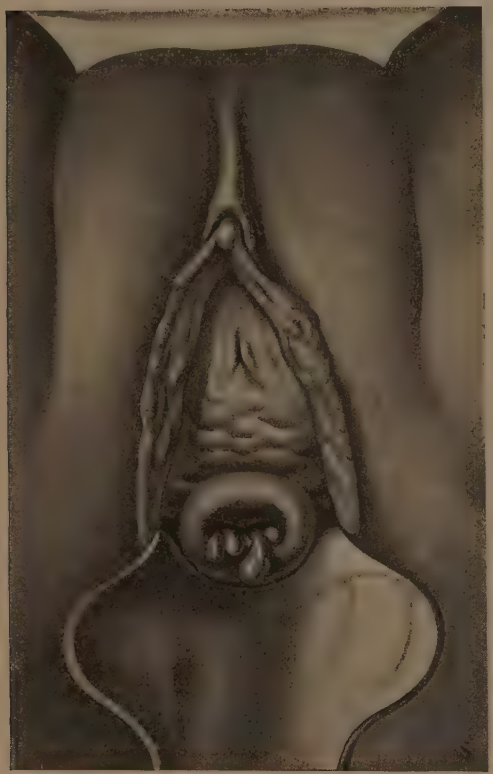


Fig. 481.—Mucous Polypi.

554. Mucous Polypi of the Uterus. — These are growths which arise from the uterine mucous membrane, and are distinct from the fibroid polypi, with which they are often confounded. (Fig. 481.) The latter arise from the muscular wall and push before them the mucous membrane. The former result from hypertrophy of the glandular structure of a limited portion of the uterus, which causes them to push out and form a polypoid growth. A number of these may occur within the cavity of the uterus and interfere with the performance of its functions. They are associated with endometritis. They are due to a localized inflammation and hypertrophy of the glandular tissue. These growths may vary from the size of a filbert or less to a growth consisting of a grape-like cluster of glands attaining the size of a small orange, which is extruded from the cervix, and hangs by a pedicle from the uterine cavity. These growths may occur upon any part of

the mucous membrane; frequently they arise from the cervix and protrude from the os in small masses. The treatment of these growths is the same as that of the inflammation with which they are associated: thorough curetment of the uterus; removal of the growths; disinfection and sterilization of the uterine canal and gauze packing to promote subsequent drainage. The operation should not be devoted to the removal of the growths alone, as the cervical canal is likely to become irritated and cause subsequent pelvic inflammation.

Another form of uterine tumor is *placental polypus*, which consists of a mass of coagulated blood, in association with a portion of the placenta or the decidua, which hangs by a pedicle from the uterine cavity and acts as a source of irritation until its removal. The mass becomes compressed in the uterine cavity and forms a firm growth, which can subsequently become partly organized, or, under the influence of insufficient nutrition, may become decomposed, and cause putrid intoxication. The treatment will consist in the thorough removal of the growth. This can be done with the finger, or by the introduction of forceps, which seize and twist off the tumor.

555. Malignant Tumors.—By malignant tumors is understood those which can severely injure or arrest the life function of the organism. But this definition is not complete, for the reason that it would include a myoma from which the patient suffered hemorrhage, or which produces compression of the ureters, resulting in hydronephrosis, and fatal uremia. A malignant tumor of the uterus, then, is one which destroys the organ in which it originates and penetrates to the surrounding structures without limit to its growth. There is no tissue of the body which is in a condition to offer resistance to the encroachment of so malignant a tumor. Malignant growths are further characterized by a tendency to extend themselves to remote tissues and organs by passage through the lymph- and blood-vessels. Loosened pieces of tissue or infectious products are washed away from their original sources to new locations, thus affording development to new foci of structure similar to that from which they originated. A further characteristic is that they show a tendency to relapse after removal. The limit between malignant and benign tumors is difficult to fix. Thus, papillary ovarian cysts may rupture and subsequently implant themselves upon and infect the general peritoneal cavity. Syphilis and tuberculosis show a disposition to extend to the surrounding structures and to be reimplanted through the blood-vessels. But the manifestations of syphilis and tuberculosis are capable of modification, of arrest, and even cure. The papillary infection generally undergoes atrophy

and disappears when the original source of infection has been removed.

556. Classification.—We are equally at a loss to fix a proper standard when we come to the classification of these growths. The clinical properties are not sufficient for a classification, as we find, in growths of dissimilar origin, similar clinical phenomena. The growths may be divided into carcinoma, sarcoma, chorio-epithelioma malignum, and endothelioma. Carcinoma originates from the epithelial tissue of the surface and the glandular structure; sarcoma in the connective tissue; chorio-epithelioma malignum in the syncytial structure of the ovum, and endothelioma from the endothelium of the lymph-vessels, blood-vessels, and serous membranes. Carcinomata are distinguished from sarcoma by the fact that they develop from the epithelial tissue and have rather a distinct tendency to alveolar and atypical glandular formation with a fairly well-defined connective-tissue stroma. The sarcomata, on the other hand, arise from the connective-tissue elements and exhibit a more or less uniform cellular appearance. Furthermore, they are, as a rule, without any alveolar arrangement.

557. Carcinomata.—Carcinomata are divided, according to their anatomical situation, into carcinoma of the neck and of the body of the uterus; from their histogenetic structure into the squamous-cell carcinoma and cylindric-cell carcinoma or adenocarcinoma. Both these forms occur in the cervix; the squamous-cell in that portion called by the Germans the portio vaginalis, which comprises the cervix external to the external os. The cylindric-cell carcinoma occurs in the cervical canal between the external and internal os. Carcinoma of the body of the uterus is almost exclusively of the cylindric-cell variety. However, a few rare cases of squamous-cell carcinoma have been found in the body of the uterus, and are attributed by Williams to the presence of aberrant epithelium.

558. General Pathology.—(1) *Squamous-cell Carcinoma.*—Squamous-cell carcinoma originates in the pavement epithelium and affects principally the vaginal portion of the cervix. The disease begins as a proliferation of the cells of the deeper layer, the rete malpighii, from which down-growths of solid processes are sent into the subjacent structures, distending their interfibrillar spaces (Fig. 482). The invading processes continue to grow and form large alveolar spaces. These assemblages of cells, called cell nests, may be plentiful or scattered. In the latter they are often ill formed and difficult to find. Their existence, however, should be considered as confirmation of the presence of malignant disease. These cones or projections find the muscular tissue no bar to their progress. They present

collections of polymorphous cells which overlie one another or are arranged cylindrically, and hence are known as epithelial pearls. Spaces form in the center of the cone, as a result of fatty degeneration or colloid softening, which resemble the lumina of gland tubes. The thickening of the epithelium affects the deeper layers first, but subsequently the superficial layers become involved, thinned, and small papillary projections are found hanging from the free surfaces. The continued proliferation of the squamous epithelium sooner or later interferes with the nutrition of the part and results in necrosis and subsequent ulceration. The condition can often justly be

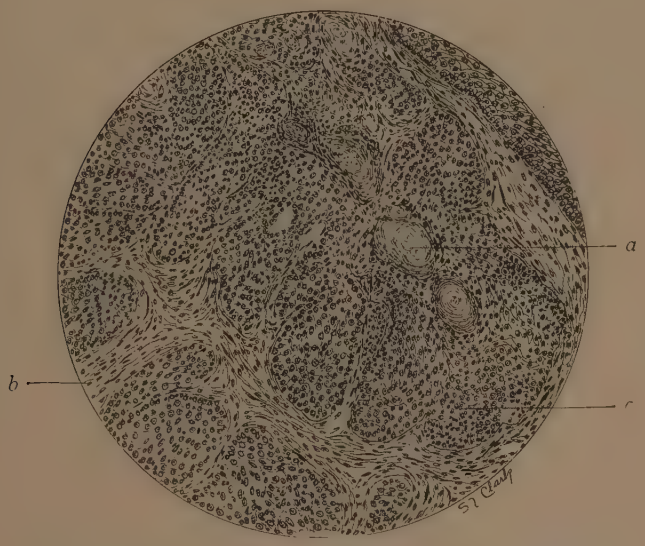


Fig. 482.—Squamous-cell Epithelioma of the Uterus.
a. Keratinization of cells forming epithelial pearls. *b*. Connective-tissue matrix. *c*. Collection of atypical cells.

described as a carcinomatous ulcer. This form of carcinoma, as we have already seen, is also in rare cases found upon the surface lining of the uterine cavity. When in this location, it is ascribed to irritation of aberrant cells.

(2) *The cylindric-cell carcinoma* of the uterus may be situated in either the body or the cervix, and it arises from the cylindric epithelium only. The neoplasm originates in the epithelium of the cervical or uterine cavity, either in that upon the surface or in that lining the glands, but with much greater frequency in the latter. Hence, it is called adenocarcinoma of the cervix or of the body. The cylindric-cell formation, developing into

the glandular type, occurs in two incidentally different forms. In the one form, the high cylindric epithelium is lower, cubic, roundish, or polymorphous, and the nuclei move from their original basal site toward the center of the cells and exhibit other evidence of change, while the cells at the same time undergo proliferation and accumulate toward the lumina of the glands, gradually filling up their cavities with cells rich in chromatin. As the neoformative process continues, with proliferation into the gland lumina, sooner or later centrifugal proliferation takes place, and the gland wall or limiting membrane is broken through, following which the uterine wall is penetrated in all directions

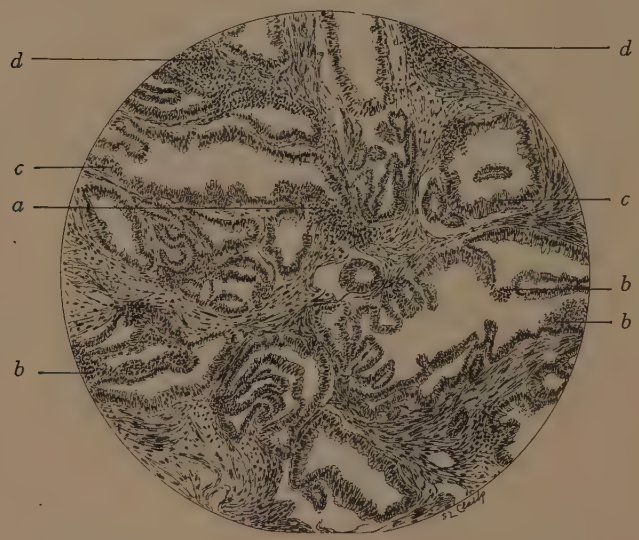


Fig. 483.—Adenocarcinoma of Body of the Uterus.

a. Cells fracturing basement membrane and infiltrating fibrous stroma. *b*, *b*, *b*. Intraglandular proliferation of cells. *c*, *c*. Irregularity of cells. *d*, *d*. Epithelial cells infiltrating stroma.

(Fig. 483). In the second form, which is more rare, the gland lumina are filled out by solid cones. This form is difficult to differentiate from the squamous-cell cancer. Individual changes consist in the loss of the cilia and a change in the situation, size, and staining properties of the nucleus. In the early stage the cells in the body and cervix retain their characteristic activity and the usual situation of the nucleus, so that one can still determine whether the carcinoma has originated in the body or the cervix. The rupture of the membrana propria and the projection of the epithelial processes through the membrane

wall in all directions cause the disappearance of the normal form of the gland and the establishment of epithelial layers. The stroma in such cases can be entirely absent, while in others it is retained in large processes. This form of cancer occurs frequently in the uterine body, quite rarely in the cervix, and very rarely in the vaginal portion. In advanced stages the gland lumina are partially or completely filled with the epithelium under simultaneous alterations of form, which process develops a pure glandular cancer. This form of disease was originally denominated by Ruge adenoma malignum, and he endeavored to differentiate it from pure glandular cancer. This differentiation, however, can not be accepted, for, in the first place, it must be remembered that an adenoma is a benign new formation, while the condition under consideration is correctly denominated pure cancer, because it destroys locally and generally. A malignant adenoma, then, must be classed as glandular cancer. It will be recognized that carcinoma has no specific cell, but that the cells found in this disease retain their form and present some characteristics of the particular structure from which the disease has originated. These cells, of course, undergo modifications of form due to the manner in which they are crowded together, but even in their polymorphous forms, when separated, resemble the cells from which they have developed. In the cervix these cells are sometimes so mixed as to render it difficult to determine the particular form of structure from which the malignant process originated, especially in cases of laceration of the cervix, where the disease involves both the squamous and cylindric epithelium.

559. Structure of the Stroma.—The stroma of carcinoma uteri is acquired from the structure of the portion in which the disease has developed. It consists of connective-tissue fibers, which have been condensed by the pushing in of the epithelial cones. The stroma develops with the proliferation of the cells. If the disease progresses outward toward the surface of the portio vaginalis, the stroma is also projected outward and forms the structure or framework for the alveolar carcinoma. In infiltration with cancer, the stroma is formed from the basic substance of the organ; thus, in cancer of the vaginal portion and in that of the cervix the stroma consists of connective tissue and muscular structure, while in carcinoma of the body it arises from the pure muscular structure. The quantity of stroma greatly differs. In the forms of squamous-cell carcinoma, as in the pure glandular variety, we have great stroma beams, while in many carcinomata of the cervix this structure is so thin that the alveoli almost touch. This is particularly marked in the carcinomata adenomatosum, in

which the epithelial structure of their basic surface lies thickly together. Investigations disclose that the cells are not attached to the stroma. They have penetrated into the stroma as foreign bodies, and are not attached to or derived from it. In the stroma are situated blood-vessels, lymphatics, and nerves. The thinner the stroma, the denser the tumor. Secondary alterations in the structure, such as fatty and hyaline degenerations, are not infrequent. In the squamous-cell variety the cervical glands are secondarily involved and the disease enters the gland from without. Experience demonstrates that the blood-vessels are slow in being involved in carcinoma. Metastasis through them is very rare.

Seelig has directed attention to the fact that the capillaries remain for a long time intact between the existent carcinomatous projections. He once saw the carcinoma collected in a ring around a vein, and it had invaded its wall up to the intima. Goldman, on the other hand, observed penetration of the carcinoma through the thin walls of a vein, and alterations of the endothelium, while the circulation was disturbed by thrombosis formation. Abel also directs attention to the history of a patient, thirty-seven years old, who had suffered for two months from irregular bleeding and discharge. Examination failed to reveal any indication of involvement of the vaginal wall or parametrium. Total extirpation of the uterus through the vagina was performed, removing as much as possible of the broad ligament. On subsequent microscopic investigation it was found that some distance from the carcinoma, in a perfectly healthy looking area, a mass of carcinomatous tissue had made its way into a vein. The occurrence of such conditions emphasizes the possibility of carcinomatous masses being transmitted through the blood-stream. The principal method of extension of carcinoma from the seat of primary infection is through the lymph-vessels. The epithelial cones spread out into the connective-tissue folds until they gradually reach large lymph-spaces. When the disease reaches one of these lymph-spaces, it rapidly extends itself. The more rapid development of cancer in pregnancy is undoubtedly due to the size and width of the lymph-spaces, and in childhood to the increased energy of the lymphatic circulation. In senile women, the vessels are small, the lymphatic vessel activity greatly decreased, and the extension of the disease is, therefore, very slow. When the deeper structures have undergone cellular infiltration, the lymph-spaces are opened and rapidly filled. Seelig, in his careful investigations upon the progress of the disease, noticed the projection forward of carcinomatous masses into the endothelial lining of the lymph-vessels. These masses

more or less obstructed the large vessels, although the vessels themselves could still be recognized in the structure. The largest lymph-spaces filled with carcinoma were found in the margin between the middle and peripheral muscle layer of the corpus uteri, where the entire muscular branches anastomose vertically. The investigation demonstrated that the carcinomatous masses press against the connective tissue or muscle fibers until they are enabled to invade the lymph-spaces. The obstruction of these vessels not infrequently results in regurgitation currents, by which portions are carried into lymphatic spaces in an opposite direction to that of the normal current. This probably affords an explanation of the invasion of the anterior wall of the vagina from cancerous disease of the cavity. With its entrance into the lymph-vessels, the disease is carried by the larger paths into the parametrium, where the lymphatics are not infrequently found filled with carcinomatous masses. They may be carried as emboli from the lymph-spaces into the next lymphatic glands without the vessels themselves being involved. While it is generally recognized that the principal channel of invasion is by way of the lymphatic vessels, yet it seems apparent that in malignant disease of the uterus the lymph-glands are involved at a later date than in cancer of other portions of the body.

I am aware that this assertion is denied by Ries, Pryor, Jacobs and others. The very careful investigations of Ries would seem to confirm his assertion that the lymphatic glands are involved early in the disease, but it is hard to reconcile this with the experience of many operators who have demonstrated the failure of malignant disease to recur after vaginal operations involving either a partial or complete removal of the uterus. Cullen accounts for the failure to involve the lymphatic glands as early in carcinoma uteri as in mammary carcinoma, by the fact that in the uterine disease there is a greater disproportion between the size of the epithelial cells and the lymphatic vessels, that the epithelial cells rapidly attain a size too large to permit of their passage through the lymphatic vessels, and it is only after the disease has reached the large lymphatic spaces and vessels that lymphatic gland infection occurs. The investigations of Blau and Dybowsky particularly emphasize the infrequent involvement of lymphatic glands in women who have died from cancer in the Berlin Charity. The former found the lymph-glands of the pelvis involved but thirty times in ninety-three sections, while the latter in one hundred and ten cases found only ten of lymphatic infection. In cancer of the cervix Blau found the lymphatic glands infected in scarcely one-third of the cases. The experience of operators would seem

to confirm the claim of the majority of investigators that lymphatic gland involvement occurs much later in uterine cancer than in other portions of the body. In the great majority of cases of recurrence after operation, the disease is situated at or near the site of removal, either in the cicatrix or in the parametrial tissue.

560. Carcinoma of the Portio Vaginalis.—Carcinoma begins as a small nodule in the mucosa, external to the external os. This nodule increases in size as a result of proliferation of the epithelium and its projection into the fibrous structure. It presents itself as a projection upon the surface of the cervix, increasing in size and forming dendritic or finger-like masses

Fig. 484.—Cauliflower Growth Involving the Vaginal Part.

or projections, which consist of vessels with numerous capillaries, and stroma filled with epithelial cones. These masses or projections may occur from one or both lips of the cervix and form a large mass known as cauliflower growth, which may attain to considerable size and fill up the vagina (Fig. 484). Another form is a small button-shaped mass projecting above the level of the cervix, more or less indurated and hardened, the surface of which ulcerates, giving rise to an excavated surface with hardened, indurated, often overhanging edges. The disease spreads from the periphery into the surrounding healthy structure and breaks down at its center into a crater-like cavity.

The tendency of this disease is to spread downward toward the vagina rather than upward into the cervical canal. In laceration of the cervix or in marked eversion of the cervical mucous membrane we may have extension from the squamous epithelium to the structure which is supplied with cylindric. The latter tissue, however, has, as a result of inflammatory conditions, undergone a previous metaplastic change of its epithelium, so that it closely resembles that of the squamous. It is only when the disease has originated in the racemose glands of the part that we find the cylindric epithelium constituting the greater part of the disease. Williams was inclined to believe that the tissue forming the line of demarcation between the pavement and cylindric epithelium at the external os was the point most vulnerable to the manifestation of malignant disease. Limbeck describes a course of development in which there is a continuation of the pure glandular with squamous cell-cancer, so that the solid cancer cones of the former variety are encompassed and held for a time by the squamous-cell form.

561. Adenocarcinoma of the Cervix.—Cancer of the cervix comprises the development of the disease in that section of the uterine mucous membrane situated between the external and internal os. This does not include the cancer which arises from erosions and ectropion of the cervical mucous membrane, which very soon assumes the clinical form and appearance of cancer of the portio. It is a disputed question whether cancer of the cervix arises from the cover epithelium of the cervical canal. This is positively denied by Williams, while Amann attributes it to the atypical proliferation of the cover epithelium and regards the glandular alteration as secondary. Winter asserts that the disease most frequently arises from the combined point of origin of glandular and cover epithelium. In the glandular variety the cells become anaplastic and polymorphous and fill the alveoli. The gland tubes are mostly thin and have small lumina. In other cases they become cystic. It is often a question whether the involvement of the glands in such cases is a benign or malignant condition. The appearance of atypical-growing epithelium, of course, is sufficient to decide the diagnosis. The determination of the invasion and destruction of the gland wall by the proliferating epithelium should be considered absolute evidence of the malignant character of the diseased process. In cancer involving the gland structure, gelatinous degeneration has appeared in the external layer of the alveoli, while the centrally situated cells were surrounded with gelatinous crust. Cases have been observed in which there was an abundant mucous colloid separation of

the carcinomatous surface. The disease presents itself in a number of ways. Thus, it may originate and develop toward the cervical cavity; in other cases it develops in the cervical tissues and is concealed behind the external os. It may appear in the lumen of the cervical canal in the form of tubercles, nodules, or papillary growths, which may fill up the cavity or be extruded from the os, while the external surface of the cervix is scarcely involved. In other cases the extensive infiltration of the diseased mucous membrane immediately within the cervix penetrates the entire periphery and produces thickening of the whole cervix (Fig. 485) or of only the infected wall. It may begin as a circumscribed nodule, within the depth of the wall, which can not be readily recognized. Cancer with pure infiltration is rare; most generally there is disintegration of the new formation either upon its surface or in the central or deeper part. An ulcer begins upon the surfaces, the superficial layers of which are thrown off. The size of the cervical canal is increased, while the wall is more or less thickened by infiltration. This process may be invisible behind an uninvolved external os or a cavity may exist which is accessible, or it may create a fissure or more or less extensive cavity, the entrance of which is directly through the cervical canal (Fig. 486). The ulceration may undermine the wall as it extends upward, so that portions of the inner wall project free into the excavation. Destruction of the carcinomatous structure leads to an extensive excavation, which gradually opens through the cervical canal in a fissure of considerable breadth. An extensive portion of the cervical canal may thus be lost.

Fig. 485.—Cancerous Ulceration of Intracervical Canal.

The method of extension in adenocarcinoma of the cervix is essentially different from carcinoma of the portio vaginalis.

In the latter, as has been indicated, the invasion is superficial and ulceration early; but in carcinoma of the cervix the invasion is upward and outward through the cervix into the parametrial connective tissue, while the portio vaginalis is involved late, if at all. Very extensive invasion and degeneration of the cervical canal occurs without the os externum presenting any break in its continuity or any disturbance of the appearance of squamous epithelial covering of the portio vaginalis. We need but to remember the changes which the cervix undergoes as a result of cystic degeneration of its glandular structure, in which the ducts of the cervical glands become obstructed, the glands distended, and in extensive involvement the walls of the cervix to a great degree perforated, to understand that the onset of a malignant growth in such a field would readily penetrate the parametrial structures before the external os presented any indication of the grave disorder. Metastasis may occur into the walls of the vagina, but the proper direction of the extension is toward the body of the uterus and into the parametrial tissue. Carcinoma not infrequently passes through the internal os and invades the mucous membrane of the uterine body. The disease may invade the entire uterine mucosa or only a small portion may be involved. In some cases the uterine mucosa may be the seat of isolated cancer nests, the result of metastasis. As the disease progresses, the thin layer of tissue intervening between the wall and the peritoneum is early involved. The vesico-cervical septum, however, is much more frequently diseased, and involvement of the bladder,

Fig. 486.—Cervical Wall Infiltrated while the Vaginal Portion is Largely Destroyed.

also, is not infrequent. The posterior cervical wall and its enveloping peritoneum are much less frequently involved in cancer of the cervix, but more frequently than in that of cancer of the portio vaginalis. Peritonitis may result from perforation or inflammation, and necrosis may cause the development of a suppurative peritonitis. When the disease has extended forward into the uterovesical septum, the bladder and ureters become involved and result in conditions resembling those described in carcinoma of the portio vaginalis.

562. Adenocarcinoma of the Uterine Body.—Carcinoma of the body of the uterus arises from the cylindric-cell epithelium of the mucous membrane and that lining the glands. It may afford considerable difficulty to determine whether the disease has originated from the cover or glandular epithelium. This distinction is only made from the histogenic standpoint, as there is no morphologic difference. Cancer arising from the cover epithelium can assume a glandular form, while the glandular epithelial cancer can completely lose this by falling away from the alveoli. It is probable that the cover epithelial cancer never arises from the unaltered cylindric epithelium, but develops only after metaplastic alterations have taken place. As a result of previous inflammation, the cylinder cells become cubic, stratified, and exhibit a resemblance to the pavement epithelium. The neoplasm, as elsewhere, consists of epithelioid elements in a connective-tissue basis. In its development the boundaries of surrounding tissue are not respected, for it grows into the glands and vessels without being arrested by their enveloping membranes. The projecting cones or nests may preserve a glandular character, and in the center of the distended lumina several layers of cubic cells are often noticed. Not infrequently the cells are arranged in concentric layers; a complete cornification with the characteristic chemical

Fig. 487.—Circumscribed Cancer of Body of Uterus.

reaction is found. Examination of the structure discloses that the centrally situated cells are polymorphous and cubic, while the peripheral long retain their cylindric type. The extension of adenocarcinoma into the deeper structures is evidenced by the prolongation of tubular projections down to and between the muscle-fibers, pushing and separating them as the disease progresses and increases from the periphery. Carcinoma of the uterine body manifests itself in different forms. It may appear either circumscribed or diffused. In the circumscribed form the tumor is frequently found with a roughened, uneven surface, the shape of which depends upon the size of the uterine cavity. At the base of this growth the infiltration extends more or less deeply into the uterine structure. Pure infiltrated cancer in the circumscribed form is rare. Proliferation from

Fig. 488.—Diffuse Cancer of Uterine Body.

its surface may fill up the uterine cavity and cause it to become considerably enlarged (Fig. 487). Occasionally a form of polypus is seen with a very small pedicle, from which a considerable sized bell-shaped, spongy nodule arises, which may fill up the entire uterine cavity. The appearance of such a growth might readily lead one to suppose that he was dealing with a polypoid growth of benign character. The removal of the mass, however, is rapidly followed by redevelopment, and probably more rapid progress from the infection of the injured tissue. Such growths may have developed from the infection of one or two glands, and proliferation of the epithelial tissue with growth of the stroma takes place into the uterine cavity until it is completely filled. Such a mass is almost pultaceous, readily breaks down under the finger without leaving much outline of its structure

(Fig. 488). In the diffuse variety there is almost simultaneous extension of the disease to the entire endometrium. Its papillary projections, villi, and nodules fill out the entire uterine cavity. Carcinomatous infiltration invades the depth of the muscular structure and penetrates it more or less deeply. As the disease progresses, it either goes toward the free surface and fills out the uterine cavity while the depth of infiltration is but slight, or it penetrates the entire uterine wall with slight growth toward its cavity (Fig. 489). Why the disease should manifest these forms is undetermined.

563. Influence of Carcinoma upon the Surrounding Tissues.—The development of malignant infiltration produces a reaction in the tissues environing it, which is manifested by extensive

Fig. 489.—Entire Cavity Covered with Nodular Growths.

small-cell infiltration and the production of exudation. This reaction is regarded as either an actual inflammation produced by infection from the surface of the suppurating cancer, or is produced in the uterine walls by the pressure of the cancer structure. It is actually an inflammation produced in the enveloping tissue by the irritation, and is an effort upon the part of nature to establish a barrier against the further progress of the malignant disease. The reaction soon envelops the alveolar structure of the cancer, frequently covering it over so the leukocytes press into the alveoli. In one case of cancer of the cervix, Auer observed a distinct thickening of the portio epithelium without it partaking of the malignant character. The same condition is observed in alterations of the mucous

membrane in the body of the cervix, which exhibits various forms of chronic metritis. In every case of cancer of the uterus a certain degree of metritis and endometritis exists. Malignant disease is not confined to the uterine walls, but develops secondary nests in the parametrium, particularly in the cellular tissue between the neck of the uterus and bladder, from which there is very early extension to the bladder-wall and ureters. When the disease penetrates the uterine wall, if upon the peritoneal surface, extensive adhesions are formed, by which the surrounding viscera become glued to the surface of the uterus. Such adhesions may involve the bladder, the omentum, or the intestine. Through this structure the disease progresses, and when finally such a nodule degenerates, an intestinal fistula can result. A secondary infection of the peritoneum in Douglas' pouch may cause a large tumor sufficient to fill its cavity. Glandular infection extends to the retroperitoneal lumbar glands about the bifurcation of the common iliac from the aorta, although glandular infection, as we have seen, is a late element in the progress of the disease. Metastasis to the abdominal viscera is much less likely in cancer of the body than in that of the cervix, since the disease does not penetrate the uterine wall nearly so rapidly. It is not an unusual occurrence to find malignant disease of the uterus complicated by benign ovarian tumors, or a cancer of the ovary may be associated. This is more common than when the disease originates in the cervix.

564. Process of Extension.—Carcinoma of the portio vaginalis, of the squamous-cell variety, forms a small nodule or elevation, in which cell proliferation usually leads to obstruction of the circulation, and, from the deprivation of nutrition, necrosis follows, causing an ulcer. The disease penetrates the deeper structures, however, much more superficially than in adenocarcinoma. It grows also from the margins of the ulcer and from new nodules which undergo a similar change. The tendency of this form, according to Ruge and Veit, is superficial; it mostly arises from the upper part of the vagina and the mucous membrane which covers the cervix, and shows a tendency to confine the extension to a great degree toward the vagina. Winter described a form in which the mucous covering of the hypertrophied papillary bodies, next the carcinoma, was apparently raw and excoriated. This layer subsequently underwent infection and carcinomatous degeneration followed. The process is somewhat similar to the form described by Schwartz as multiple epithelioma. The mucous membrane of the vaginal fornix consisted of soft, spongy, easily broken-down growths, which presented a fine papilla-like surface in the

vagina. Microscopic investigation disclosed a pure hyperplasia of the vaginal epithelium without carcinomatous degeneration.

Generally cancer of the portio vaginalis develops as an infiltration in the depth of the structure involved and is covered by intact vaginal mucous membrane, which forms an infiltration ring of extensive ulcerous destruction involving the entire affected part of the vagina. The infiltration extends into the supravaginal connective tissue. Occasionally cases of contact carcinoma occur, in which the mucous membrane becomes infected from the carcinoma over which it lies. The rarest form is the metastatic disease of the vaginal mucous membrane, in which isolated, frequently multiple knots of bluish appearance develop in the vagina with special predilection for the posterior wall of the urethral eminence. Thick nests of infiltration beneath the intact mucous membrane may involve the urethra and soon become necrotic. The extension of the disease to the uterus is no exception. Such an extension is likely to be more rapid, however, when the involvement of the cervix is of the mixed form, and as a result of cervical eversion, from laceration, the glands become infected. Should the disease extend toward the vagina, it may involve its anterior wall. A great tendency to invade the paravaginal tissue laterally and posteriorly is manifested. In this connective tissue are found nests enclosed in the large lymph-spaces. The uninvolved connective tissue could scarcely be called healthy and at the same time show inflammatory thickening and swelling into which cords project. This phenomenon undoubtedly is an expression of the inflammatory reaction to the carcinomatous disease. The bladder and ureters are involved only when the disease affects the anterior lip, and then only after it has passed into the anterior vaginal fornix or has reached the same through the vesico-cervical septum. Disease of the bladder occurs only in the more advanced cases. The first indication of extension to the bladder consists in the folds becoming thickened, swollen, and lying parallel to one another with deep intervening depressions. The mucous membrane may be elevated by small vesicles, associated with which is a deep catarrhal alteration of the mucous membrane. Carcinomatous nodules from the size of a pea to that of a walnut appear in the trigonum later. These nodules make their appearance at the internal orifice of the urethra and incidentally in the mouths of the ureters. Blau describes a case in which the entire mucous membrane had undergone an infiltration, from direct implantation, in the form of nodules and papillary growths. With the disintegration of these masses, fistulous ulcers follow, which have a cancerous infiltrated border. Such alterations can affect

either the bladder or the ureteral openings (Fig. 490). The most dangerous invasion occurs when the mass involves the ureter and may grow around and compress it. I have frequently seen the structures about the ureter involved, causing stenosis and dilatation of the portion above, until the ureter became larger than the finger and the cavity of the kidney sacculated.

In adenocarcinoma of the cervix the disease very rapidly involves the entire glandular structure, especially when it has been previously diseased. The glands have already penetrated the cervical wall, and it can be readily appreciated why the

Fig. 490.—Communication between Bladder, Vagina, and Rectum.

disease has already reached the parametrial tissue when it is first discovered. The invasion of the parametrial tissue leads to more or less thickening and rigidity of the pelvic floor, the uterus becoming more fixed. The disease can progress downward toward the cervix; metastasis takes place into the anterior wall of the vagina, probably for the reason that it follows a chain of lymphatics. It may be that blocking of the lymphatics gives rise to regurgitant currents, which carry backward nests of the disease to develop in the vaginal wall. Carcinoma of the body of the uterus is much slower in making its progress into

the uterine wall, and we frequently see the entire uterine mucosa involved without much extension into the muscular structure. In other cases the disease is seen making its way through the muscular structure and presenting itself beneath the peritoneum in the form of nests or nodules. These frequently cause inflammatory reaction and adhesions. In the cervical variety a nodule may be found projecting into the wall of the ureter. This, of course, interferes with the outward flow of urine; indeed, as the disease progresses, the canal lumen will be totally destroyed and complete obstruction result. It has already been mentioned that involvement of the lymphatic glands occurs late in malignant disease of the uterus. The lymphatic glands which are most likely to become involved in cancer of the portio vaginalis are the collection of two or three lymph-glands which are situated before the sacro-iliac articulation beneath the entrance of the pelvic plane, usually at the division of the common into the external and internal iliac arteries. From these glands, through the lymphatic anastomosis, the disease may be carried to glands in other portions of the body. Petit observed a pigeon-egg-sized diseased gland in the region of the supraclavicular gland in an inoperable cancer of the cervix. Dybowsky found inflammation in the mesenteric, bronchial, renal, the enteric, mediastinal, jugular, cervical, and supraclavicular glands when the disease had originated in the uterus. It remained undetermined whether the infection in these cases had been carried through the lymph or the blood-vessels. It remains evident, however, that lymph infection in uterine cancer does not recur so early or to so extensive a degree in carcinoma of the uterus as in that of the mammary gland. Cullen attributes this to the fact that there is a greater disproportion between the size of the involved epithelium and the lymphatic vessels, and it is only when the disease has invaded the structures to such a degree that large vessels are reached and invaded, that such infection takes place.

565. Clinical Forms.—We have already seen that cancer is divided from a histogenic standpoint into two forms, the squamous-cell and the cylindric-cell cancer; clinically it is divided into carcinoma of the portio vaginalis of the cervix and of the body of the uterus. It is still further divided clinically according to the course that the disease pursues and the physical signs presented. Thus, a malignant formation of epithelial masses may break down upon its surface or in its center. The growth can project from the portio vaginalis into the lumen of the vagina, or, at the same time, the connective tissue of the portio be occupied by the stroma and penetrated to its depth by cancer masses. This most frequently develops itself in the cancer

of the portio above the level and toward the lumen of the vagina, by which is secreted a superficially situated tumor which is known as a cauliflower growth. It lies as a more or less roundish polypoid tumor in the vagina, which may completely distend it and present a tumor the size of a fist, which becomes more contracted and firmer as we approach the healthy structure. The surface of the cauliflower, after desquamation of its pavement epithelium, reveals exposed carcinomatous masses and creates an irregular or papillary condition. When the disease has had a longer duration, with unfavorable nutrition of its interior surface and with compression of the vessels, masses become necrotic and the cauliflower growth is covered with a grayish, greenish, smeary mass. Such growths most frequently take their origin from the posterior lip. In many cases the disease arises in one commissure and extends from it to the lip, rarely the entire portio vaginalis is simultaneously degenerated. In other cases processes of epithelial growth project into the substance of the portio, and in deep infiltration there is thickening of one lip of the commissure. In rare cases the entire portio vaginalis becomes involved and the more affected lip grows toward the lumen of the vagina. This form differs from the cauliflower growth by being polypoid and by having a mucous membrane drawn over it, which is rarely quite intact. Frequently the mucous membrane is thrown off in superficial layers and is followed by disintegration of the surface of the infiltration, or it begins in the center and opens through the infiltration to the outside. A smooth funnel or fissure will thus be formed, with jagged, often undermined borders, sharply lying toward the circumference and appearing under the level of the healthy surroundings. In such a fissure an ulcer will occasionally dissect deeply into the portio. Movable polypoid tumors will project into the ulcer or around the cervical canal, without special alteration of the canal itself (Fig. 491). Smooth ulcers are occasionally observed, similar to the erosion which extends to a very trifling depth. Why these variations in the progress of the disease exist is as yet undetermined.

Fig. 491.—Cervical Canal Destroyed by Progress of Disease.

566. Etiology.—Of the causes of malignant disease we have as yet no definite knowledge, and are forced to accept that theory which affords the most plausible view of its development. Among some of the more important theories as to its development are Virchow's, that while cancer is of epithelial origin, it is only through metaplasia or mesodermal elements that it originates; in other words, a transformation of the connective-tissue cells. Cohnheim advocates the theory that it was transmitted from embryonic carcinoma germs. Riberts believed the epithelial cells separated from their connection without anaplasia; Thiersch and Waldeyer, that by primary growth of the epithelium, without alterations of biologic properties of the epithelial cells. All agree that there is no distinctive cancer cell.

In recent years increased attention has been concentrated upon the determination of some micro-organism which shall prove to be a causative factor. Such a theory seems favored by the natural history of the disease, its mode of origin, its invasion of the surrounding structure, and its transmission by the blood- and lymph-vessels. The mere fact that a specific micro-organism has never been isolated and recognized is not a convincing objection, for syphilis has baffled all attempts to recognize its essential organism, yet no one doubts that it is so transmitted. Klebs presented a bacillus, but later investigations have failed to confirm its existence. The presence of cancer results in the development of micro-organisms of various kinds, just as we find in other inflammatory processes, but none of those recognized will reproduce the disease. Various degenerative processes in the cells have been indicated as possessing the parasitic elements, only to be proved untenable. Schwarz has most convincingly demonstrated that the majority of cell alterations favoring the parasitic theory have so far resulted from degenerative processes of the epithelial cells, leukocytes or their derivatives. A fundamental pathologic difference exists in that with the malignant a further extension of the processes in the organism is influenced by the cell activity, and there is as yet absolutely wanting any proof of isolation of a parasite from which the disease can be generated by its employment. The absence of any history of the transmission from man to animal or from one animal to another has been cited.

The occurrence of carcinoma in the penis of the male who has cohabited with a cancerous female is so rare as to be the exception to the rule, yet these negative arguments are only additional evidence that we do not know the micro-organism or its natural history. Surgeons not infrequently injure themselves while operating, but no authentic case exists by which the development of cancer can thus be traced. Evidently, increasing

age forms in the cell a disposition to carcinomatous degeneration. Statistics indicate that a uterine cancer before the twentieth year does not occur, and that it is only rarely observed during the next ten years. It is present with increased frequency during the third decennium, but the majority of cases are found in the fourth. Thiersch believed the greater frequency of cancer with advancing age was due to atrophy of the connective tissue, which favored the deeper infiltration of the epithelial tissue, but this is a mere hypothesis. Undoubtedly carcinoma occurs with much greater frequency now than formerly. Reyburn and Lewers attribute this to diet, and direct the attention to the infrequency of this disease among rice-eating populations. They assert that the disease is largely due to the consumption of large quantities of meat.

Heredity.—Inherited predisposition to the development of cancer has been regarded as an important factor, but careful researches by Gusserow showed but 7.4 per cent. favoring such a tendency, while von Winckel found but 6.3 per cent. Inherited lowered resistance to disease, as shown in families predisposed to tuberculosis and chronic renal disease, favors the development of malignancy.

Sex.—Twice as many women suffer from cancer as men. Next to the mammary gland, the disease occurs more frequently in the uterus. According to Hofmeier, fully one-fourth of all cancers are uterine.

Condition of Life.—Cancer of the uterus greatly preponderates in the poorer classes, in whom the feeble nutrition, great toil, and more exacting lives favor degenerative processes.

Sexual Activity.—All statistics prove that malignant disease preponderates in those who lead an active sexual life, especially in the multiparous woman. Gusserow's investigation of a large number of cases gave the average of fruitful labors in cancerously afflicted women as 5.1 per cent.—a proportion of births considerably above the average for women taken together. Accepting the irritation theory of Virchow as a factor, we can readily appreciate the greater frequency of cancer of the cervix. The possibility of cancer of the cervix in the chaste virgin has been doubted, but I have seen several single women of unquestionable virtue who suffered from cancer of the cervix. Cancer of the body of the uterus is comparatively more frequent in the unmarried and nulliparous women. The theory that cancer can be produced by excessive coition is not borne out in the lives of prostitutes. Carcinoma may be secondary in the uterus, having originated in the bladder or vagina. Myoma of the uterus is sometimes associated with cancer, but not so frequently as to render it noticeable as a predisposing cause. Landau is inclined to assign syphilis as a

predisposing cause, but my observation does not incline me to accept it. Von Winckel's assertion that gonorrhea is an important factor in the development of cancer needs confirmation. With all our investigations we are driven back to irritation as a cause for malignant disease, but its existence does not always determine such a degeneration. We are forced to acknowledge that we do not know why cancer develops.

567. Symptoms.—Unfortunately, in the early stages no symptoms, either subjective or objective, are sufficiently marked to give warning of the impending danger. As a consequence, the physician rarely has an opportunity to investigate the disease early. Cancer has no pathognomonic signs; the principal symptoms—hemorrhage, more or less offensive discharge, and pain—are not constant in all cases, and each one may be produced by other than malignant conditions. Bleeding is the symptom of greatest significance, and may occur when the canal of the cervix is affected, though the vaginal margin is uninvolved. The quantity of blood lost will probably be slight and irregular, as a few drops after severe exertion, straining at stool, or following the act of coition. In the married post-coitive hemorrhage is a most constant and suggestive symptom. Generally the first intimation will be an increase of the amount of blood lost at menstruation, or the flow will be continued unduly long, but this is not constant. In other cases the first indication will be a profuse bleeding. After the occurrence of the climacteric, an occasionally more or less profuse bleeding will occur at intervals, which causes the patient to think that her menses have returned. Post-climacteric pudendal bleeding should always be regarded as a serious danger-signal until careful and painstaking examination has demonstrated the contrary. As the disease advances, hemorrhage becomes more active, the blood is discharged in a continuous bright stream, or more frequently in large clots, which are formed in the vagina. Frequently the hemorrhage is accompanied by a discharge of fragments of disintegrating tissue. The continuation of hemorrhage produces marked anemia and promotes the cachexia, but is rarely the direct cause of death. Unfortunately, women generally regard increased and irregular bleeding as a necessary concomitant to the climacteric, a view which is maintained too frequently by the attending physician. On the contrary, any excess and irregularity in the flow should always be regarded as an indication of grave danger, demanding most thorough investigation of the genital tract, supplemented by microscopic investigation, if necessary, to ascertain the specific cause. Nothing should be taken for granted or left to chance. No palliative measures or remedies to arrest bleeding should be employed prior to an examination. If the physician

is unable to satisfy himself as to the cause, duty to his patient demands that she shall have the benefit of further consultation.

Offensive discharge is next to hemorrhage in the time and frequency of its appearance. In an early stage the discharge is slimy and serous and does not have an especially penetrating and offensive odor. As the disease advances and is associated with ulceration and disintegration of tissue, the secretion changes; it becomes yellowish; then, with a mixture of blood and disintegrating tissue, reddish and brownish; and, finally, a dark, smeary mass. At first it has a stale, sweetish odor, becomes more disagreeable, and finally presents an intensely penetrating, stinking smell, alike disgusting to the patient and to her attendants. When patients have suffered from cervical discharge possibly for years, little attention is given to the increase of the amount until the odor becomes so marked and disagreeable as to demand consideration, when it will frequently be found that the time for successful treatment has probably passed. Decomposition of the secretion is undoubtedly due to saprophytic or putrescent germs, and the greater accessibility of the cervix causes the odor of its secretion to become earlier affected than that of the uterine cavity.

Pain is a comparatively late symptom. The cervix, as is well known, is not a specially sensitive structure, and the severe pain occurs with the involvement of the parametrium, and is later increased by pressure upon nerve-trunks. In uterine cancer, or when it involves the cervical canal, pain is more marked, and is an earlier symptom, owing to encroachment upon the internal os and obstruction to the canal. The absence of pain leads many patients to regard the increased bleeding and discharge with less suspicion. When an effort is made to impress a woman so afflicted with the gravity of the situation, she will doubtingly exclaim: "Why, I have no pain!" Slightly extended nodules near the cervix, by pressure upon the nervous plexuses in the retroperitoneal connective tissue, may produce a lively, persistent boring pain in the depth of the pelvis, which is increased to an extraordinary degree by the slightest extension. It causes persistent lancinating pain, which is not alleviated by continuous rest in bed, and only the persistent employment of narcotics affords any mitigation. As the disease approaches the peritoneal surface the pain is increased, serious reaction in the nutrition is induced, from which inflammatory adhesions with the surrounding structures are the result, and an extensive peritonitis is thus caused. The abdomen is sensitive to pressure, and, according to Schröder, vaginal examination reveals the uterus surrounded by board-like hardness. Not infrequently the symptoms may be aggravated by compression and narrowing of the

rectum through advancing infiltration of the pelvic connective tissue.

The mechanical obstruction to the passage of fecal masses is generally associated with severe, agonizing pain; obstinate constipation arises, partly from the mechanical hindrance, but much more from the desire to avoid the severe pain at stool. In cancer of the neck of the uterus, when the disease is transmitted to the bladder-wall, even before the entire wall is penetrated there is a burning sensation during the evacuation of urine, soon followed by tenesmus, frequent micturition, bloody, clouded, or purulent urine, with persistent vesical pain. With the infiltration and necrosis of the structure a direct communication follows. The admixture of ammoniacal urine with the offensive vaginal discharge aggravates the already lamentable condition of the patient by a horrible stench. The profuse, irritating vaginal discharge produces an extensive erythema of the vulva and inner sides of the thighs, and causes the patient to complain of the intense itching, or pruritus vulvæ.

The offensive character of the pudendal discharge may be still more aggravated when the disease involves the peritoneal surfaces of Douglas' pouch and is transmitted to the rectum and upper part of the rectovaginal septum, which breaks down and forms a rectovaginal opening. Occasionally, a large cloaca is formed, into which is discharged urine and feces, mixed with decaying tissue, and forming a most deplorable condition. Fortunately, the rectum is less frequently involved than the bladder. Frommel asserts that vesical fistula appears in one-third of all cases, rectal fistula in one-sixth. In the progress of the cancerous infiltration on either side or in front of the cervix, the ureters will sooner or later become involved. The infiltration extends about and compresses their lumina, attacks the structures of the wall, and may finally completely occlude it. So long as the passage of urine remains free, the patient experiences no ill effect, but the compression causes a gradual dilatation of the ureter and pelvis of the kidney; a condition of hydronephrosis follows, and indications of uremia. If but one side is affected, the other kidney does compensatory work, and, beyond a possible sense of fullness and weight in the affected organ, there is but little discomfort. When both organs are compressed, uremic symptoms follow, though never violent, rarely convulsive, and gradual coma is developed, which causes increased indifference to surroundings, and, fortunately, to the profuse pain. Disgust for food is marked. Vomiting frequently occurs and suppression of urine may be present. The condition has its compensation in that such patients are relieved by the coma from previously marked pain.

Reduction in pressure from degenerative changes in the infiltration will often restore the caliber of the canal and permit the urine to pass. The sensorium will become free and so continue until new compression symptoms appear. An autopsy frequently discloses above the cancer infiltration dilated ureters, sacculated kidneys, occasionally pyelonephrosis and amyloid degeneration of the kidney. Continuation of the infiltration processes causes obstruction of the veins and arteries of the pelvis with edema of the vulva and of the lower extremities. Hemorrhoidal veins become greatly distended and cause profuse bleeding. The resistance of the peritoneum to the encroachment of the disease is very marked. Its approach to the peritoneum is followed by reactive inflammation and extensive adhesions, so that cancerous nodules rarely reach the peritoneal cavity. Sepsis is also rare. When septic peritonitis is produced, it is caused by rupture, by pyosalpinx, or by penetration of the cavity from the cancerous nest. While sapremic symptoms are frequently associated with cancer, the temperature elevation is not high, for the reason that the disintegrating tissue is usually shut off from the general system by a zone of hard infiltration tissue, which is not very absorptive. When high temperature is present, it is generally due to an extension of the disease to other organs, especially the bladder. It is very important to ascertain the presence of metastasis to other organs. In the ordinary course of the disease it extends to the vagina, bladder, rectum, and vulva; but it may reach the same glands by metastasis, as well as the ovary and retroperitoneal glands. Metastasis may occur into remote organs, as, the liver, lungs, and kidney, although the number of cases in which wide diffusion occurs is comparatively few.

Cancer affects the mature, debilitated, and overworked, but is also found in the well nourished, and not infrequently in the comparatively young. (Fig. 492.) The disease in the latter is usually much more rapid in its course. Its mere existence is an evidence of lessened resistance to its ravages. In the early stages, with patients in good condition, the general appearance would contraindicate its existence; but with recurring hemorrhage and discharge, emaciation rapidly occurs. Emaciation is more rapid when to the other symptoms is added pain, which robs the patient of her night's rest. To the drain from hemorrhage and to the loss of rest is soon added the depressing effect of the putrid changes, from a collection of organisms which exert a very painful influence upon the general condition. The skin is pale, and gradually becomes a smutty yellow from increased emaciation. The eyes are sunken and the skin is thrown into loose folds or appears to be drawn over the skeleton. A patient exhibiting such changes is said to be cachectic. The indications

of suffering are stamped upon the countenance so indelibly as to be readily recognized by the experienced observer. From other conditions causing uterine hemorrhage, as myoma especially, a cancerous patient is recognized by the tanned appearance of the skin and the progressive emaciation. In myoma she may become pale, anemic, and often yellow, but there is no loss of flesh. Indeed, the embonpoint seems increased. In cancer the loss of strength is aggravated through the increased disgust for food occasioned by the foul-smelling atmosphere in which she is forced to live. Gusserow's view is undoubtedly correct, that the intense odor occasions the nausea and is made manifest by the return of appetite, when by any medical or surgical procedure this symptom is temporarily removed. Vomiting is generally a

Fig. 492.—Uterus Removed from an Unmarried Woman Twenty-two Years of Age.

late symptom and most frequently the result of uremia. Rarely, it may be occasioned by invasion of the peritoneum. The loss of strength and flesh is progressive, until finally the patient dies in profound marasmus. Occasionally, she suffers no convulsive attacks from uremia, but just sufficient coma to render her insensible to the discomfort of the condition. In some cases septic or carcinomatous peritonitis, pleurisy, pneumonia, lung embolism, or amyloid degeneration of the large glands leads to a premature end.

568. Physical Signs.—In the previous discussion it has been asserted that carcinoma has no pathognomonic symptoms, consequently its early recognition will largely depend upon the correct interpretation of the physical signs. Unfortunately, the patient

may have no symptoms affording such discomfort that she will feel it necessary to consult a physician, and as a natural consequence the disease will often be advanced before the patient comes under observation. Many patients do come under observation, however, and are subjected to local treatment for other conditions than the grave one which should attract the attention of the observer, and valuable time is thus lost. It is to save these cases that, at the risk of reiteration, this section is written. The disease in many cases is hidden within the uterus and the physical signs consequently obscured. Fortunately, in the great majority of patients the disease affects the cervix and cervical canal. The squamous-cell cancer affects the external portion of the cervix and appears as a small tubercle or projection upon one or the other lip of the cervix. In the majority of cases a more or less extensive laceration of the cervix will be present. This tubercle will give the sensation to the examining finger of a shot-like mass, but manipulation of it is associated with slight bleeding and often the papule will be friable and can be broken off. As the disease advances, the surface presents a superficial ulceration, which is above the level of the surrounding healthy structure. Its edges are prominent, infiltrated, ragged, often overhanging; its surface more or less excavated, covered with friable tissue, portions of which are easily broken off, and it has an infiltrated base. Pressure against such a surface with a sound permits the point of the instrument to become buried in friable tissue. The most careful examination is attended with bleeding. Frequently the vagina will be found occupied by a mass which may vary from the size of a filbert to that of a good-sized fist. Such a tumor presents an irregular, pinkish-gray surface, often covered with a greenish-yellow exudate. The mass is continuous with one lip or the entire cervix may be involved. The surface has a granular, friable feel, will readily give way under the pressure of the finger or of an instrument, and is associated with a very offensive discharge. Adenocarcinoma within the cervical canal may make extensive progress before it becomes visible. Even when invisible, the external portion of the cervix appears paler, gives a sensation of hardness or resistance to the examining finger, which is firmer and less elastic than when due to inflammatory exudation. The cervix will often feel hard and dense when carefully palpated, and the pressure usually causes a discharge of blood from the os. Very frequently the existence of a laceration will permit access of the finger, which will reveal the presence of hard nodules, fragments of which are easily broken away. The surfaces instead may present a large mass of infiltration, the center of which has become necrosed, affording an excavation with infiltrated, over-

hanging edges and a pultaceous, friable surface. In more advanced cases the cervix may be a mere shell, a large part of the uterus being involved. The infiltration can be recognized to involve the walls of the vagina, the lumen of which is contracted by the disease. Carcinoma of the uterine body may be inaccessible to touch until well advanced, unless its uterine canal is subject to dilatation. Intrauterine indagation reveals an outgrowth from a portion or the whole of the uterine cavity, which, soft and friable to the finger, rests upon a firm and indurated base. When the wall of the uterus is extensively infiltrated, the increased resistance can be recognized by recto-abdominal palpation. The penetration of the uterine wall by the infiltrate is recognized in the nodules beneath the peritoneum, which roughen the otherwise smooth surface of the uterus. No discussion of the physical signs of carcinoma is complete without a consideration of the revelations of the microscope, but as they have been partially studied under the various forms of disease, and will be further under diagnosis, I will not discuss them here.

569. Complications.—The more frequent complications of uterine cancer are myoma, ovarian tumor, peri-uterine inflammation, and pregnancy. Myoma usually does, and ovarian tumor may, precede the development of carcinoma. Attention has been recently directed to the association of myoma and carcinoma in the same patient (see Fig. 460), with some effort to indicate the causative relation; but with the great frequency of uterine myoma it would not be surprising should we find, even more frequently than is now recognized, the coexistence of carcinoma. The disease begins in the uterine mucous membrane, and may subsequently extend and infiltrate the growth. The growth can be primarily affected only when there is included in it some glandular structure. It has occurred to me that the irritation induced by the prolonged use of electricity for its influence upon the fibroid growth may favor the development of malignant disease. I have seen carcinoma occur in two cases subsequent to the application of electricity, but the cases under observation have been so few that to make this assertion would be no more correct than to assign myoma as the cause of the cancer. Ovarian tumor may be benign or malignant. Benign growths may become secondarily involved. The cancerous tumor of the ovary, however, varies greatly in its influence and in its manner of progress from the benign.

Peri-uterine Inflammation.—Peri-uterine inflammation may precede or be the consequence of the malignant disease. In the latter instance it is simply a reactive inflammation in which nature endeavors to bar the progress of the malignant disorder. It is important, in investigation of the case, however, to differen-

tiate between the peri-uterine exudation and the cancerous infiltration, as such a diagnosis would influence the operator in his treatment of the cancerous uterus.

Pregnancy is a not infrequent complication of malignant disease. Carcinoma in its earliest stages does not contraindicate the occurrence of pregnancy. The association of uterine cancer with pregnancy and labor presents the gravest danger for two human beings. The frequency of the complication may be determined by the consideration of the following statistics: Von Winckel in 20,000 labors reported 10, and Stratz 7 in less than 18,000; in the Tübingen clinic, in fifteen years, out of 5001 labors there were 7 complicated with carcinoma. One cause of the few cases of association of pregnancy and carcinoma is the fact that the latter exists in the great majority of cases in the later years of life after the period of fertility is more or less nearly passed. The situation of the disease will have something to do with the possibility of pregnancy. In 89 cases of associated pregnancy and carcinoma the malignant disease was found 38 times in the cervical canal and 47 times in the portio vaginalis. In four cases the site was not determined.

The disease, when complicated by pregnancy, presents no symptoms essentially different from those in the uncomplicated cases, but with the necessarily increased congestion of the pelvic organs makes more rapid progress, so the characteristic symptoms—hemorrhage, discharge, and pain—rapidly become aggravated. Hemorrhage is increased, is more or less copious, and is associated with an offensive odor. A profuse, watery, exceedingly offensive discharge, at times purulent and brownish, is constant. The discharge is more abundant and putrid the more marked the tissue destruction in the new formation.

It is of interest to study the effect of carcinoma on pregnancy and labor. The disturbances which such complications can induce in the course of pregnancy and labor must necessarily depend upon the situation and extension of carcinomatous disease; sometimes they are only trifling, but occasionally they may mean the death of mother and child. The progressive and severe hemorrhage, the profuse leukorrheal discharge, associated with a complication of pregnancy, result in general anemia, which produces a gradual loss of strength. The existence of the trouble renders the development of cancer much more rapid, and consequently early interference should be considered as indicated. The influence upon the labor, when the pregnancy goes to full term, depends entirely upon the situation of the disease. The accompanying endometritic processes can lead to existence of placenta prævia. When the disease is confined to the vaginal portion of the cervix, it will not be impossible for labor to be

spontaneous, but obstructions occur as soon as the portio is circularly seized in its entire circumference; or, if the cervical canal has become strongly infiltrated, the tissue is absolutely unyielding. Unless prompt measures are resorted to, such an individual may suffer from hemorrhage, exhaustion, and fatal termination, with the fetus still *intra partum*.

Among the complications with labor we can have premature rupture of the bladder and weak labor pains. If the pains remain active, the embryo is forced through, and the process results in extensive tearing of the cervix, which may extend to the pericervical connective tissue, cause the most extensive bruising and crushing of the birth canal, and the cervix may even be torn away above the infiltrated ring. Equally significant is the influence of pregnancy and labor upon the cancer. As has been mentioned, it was considered that the existence of pregnancy had a beneficial influence on the progress of the cancer growth. Von Siebold is reported to have observed the spontaneous recovery of genital cancer from a simultaneous pregnancy. The experience of recent years combats this idea. The rapidity of the growth depends upon the character of the disease, being much more rapid in the soft and medullary form than in the scirrhous variety. The labor can cause the most extensive destruction of the parts, and, not only this, but be followed by infection of the tissue, which can result in thrombosis, sepsis, and pyemia.

570. Diagnosis.—The early recognition of cancer will frequently afford the only hope for its radical relief. The investigations of Virchow dismissed the idea of cancer being in origin a constitutional disease and demonstrated its purely local character. A study of its clinical course, however, indicates that while the disease is local in character at its origin, transmission to the surrounding structures takes place, when the disease practically becomes constitutional. It is important, therefore, that the practitioner should recognize the gravity of the disease at the earliest possible moment. When the condition is one of doubt, the attending physician, in the interest of his patient, should have the doubt resolved by securing the advice of a more experienced man. Only by early recognition and by radical treatment before the extension of nests into the parametrial tissue can we hope to avoid the fatal termination of this disease. It is well recognized that many patients fail to appreciate the gravity of their symptoms and postpone consulting a physician until the favorable period for intervention has passed, but it is equally true that many others are subjected to general or local treatment or are advised to await the change of life until the disease has become hopelessly inoperable. This is frequently brought about through aversion of the patient to the gynecologic examination,

but the physician will be wiser in absolutely declining to accept the responsibility for the treatment of a patient who declines to permit him to employ the necessary means to determine her condition. Should he yield to her request, she and her friends will subsequently hold him responsible for any untoward results.

The ease with which the diagnosis can be made will depend upon the situation of the disease. Following the division already given of cancer involving the portio vaginalis, the cervical canal, and the body of the uterus prepares one to find different physical signs according to its situation. The association of hemorrhage, foul discharge, and pain should awaken a profound suspicion that should be satisfied only by careful examination. Carcinoma of the portio vaginalis is, as a rule, easy to recognize. It is accessible to the investigating finger, and is readily exposed to vision by the speculum. The most characteristic form is the cauliflower growth, which springs by a narrow base from one or the other lip, and may fill the vagina. It presents to the finger an irregular, nodular mass, which bleeds upon the slightest touch, is very friable, and is frequently covered by a greenish exudate or slough. The mass may vary from a nodule the size of a bean to a growth the size of a fist. Instead of an exuberant growth the disease may present an excavated cavity with indurated wall and base and undermined edges. In diseases of the cervical canal the external os may present a crater-like opening or may appear healthy. In the early stage the disease of the cervical canal affords no external or apparent indication of the disease. The infiltration involves only the mucous membrane of the canal.

If we follow the rule to secure an accurate examination of such cases, it may be necessary to explore the intra-uterine cavity. This procedure is best accomplished by the use of laminaria tents. These tents should be sterile, and should be removed from a saturated solution of iodoform and ether before their introduction. Tissue occupied by carcinomatous infiltrate will not readily dilate. The scrapings obtained by the curet will often show fragments which are easily broken or crumbled, in place of the long, thickened pieces removed in endometritis. The curet and, still better, the finger will disclose a roughened, indurated canal, which is characteristic. In a very early stage the cervical cancer appears as small, indurated nodules, which later become friable. It should be recognized that cancer of the vaginal portion does not manifest a disposition to involve the cervical cavity early, which knowledge enables us to determine that the cervix remains free unless in advanced cases. In doubtful cases the suspected tissue, either in the form of scrapings or an excised piece, should be subjected to microscopic examination. The portion of tissue excised should involve both healthy and

diseased tissue, when the transition from one to the other can be better studied. It is objected to the microscopic examination that it takes valuable time to prepare the specimens, but Smyly suggests the following two methods for rapid examination: First, a small piece of firm tissue is selected, dipped in mucilage, placed in a freezing microtome, partly frozen sections of which are cut, transferred to Müller's fluid or to a 2 per cent. solution of potassii bichromas, and, after from a few minutes to an hour, stained and mounted. In the second method a piece of the tissue the size of a bean is placed in twenty times the quantity of methylated spirit or, preferably, in alcohol for a few hours, then a few hours in running water, dipped in mucilage, and sections made after freezing. The sections are removed from water to the slide, where they are stained with either picrocarmin or rubin and orange. These methods are too complicated for the general practitioner.

Spiegelberg has emphasized the closer adhesion of the mucous membrane to the underlying tissue in cancer over that which exists in inflammation. Our diagnosis must comprise, naturally, the recognition of the presence of cancer, and, also, the extent of structure involvement and the probability for radical removal. Digital examination through the rectum affords accurate information as to the extent of the disease in the parametrial tissue of the pelvis. Nests or nodules may be found upon the posterior surface of the broad ligament, which cause firm fixation by the extension of the disease to one or both broad ligaments. We should endeavor to distinguish between fixation from previous inflammatory trouble and cancerous infiltration. In the latter the involved surface is more irregular, presents small, hard nodules, and a more distinct limitation, which can be determined through the rectum. The latter examination can be more effectively accomplished with the patient under an anesthetic. A rectal examination should be a matter of routine. Twice I have found coexisting rectal cancer in women who otherwise would have been favorable cases for uterine extirpation. In neither of these patients did there seem to be any connection between the cancerous growth of the rectum and that of the uterus.

The conditions which can be confused with cancer are:

Chronic cervical catarrh with laceration.

Papillary erosion of the cervix.

Necrosis of fibroid polypus.

Syphilitic ulceration.

Partial retention of the products of conception.

Chorio-epithelioma.

Sarcoma.

In chronic cervical catarrh with laceration nature makes an effort to repair the injury, the increased weight of the organ and its situation lead to eversion of the lips, and the fissures are occupied by hard, resistant tissue. The exposure of the tender cervical mucous membrane causes inflammatory changes, thickening and eversion, obstruction of the ducts of the glands of Naboth, and the formation of Nabothian cysts. The surface not infrequently is covered with granular tissue, which readily bleeds upon the slightest touch; the patient consequently has increased bleeding during menstruation, more or less bleeding upon exercise, and bleeding following coition. The indurated surface with a tendency to bleed, the increased leukorrheal discharge, the nodular condition produced by the distended glands, might readily lead an inexperienced physician to believe that he had to deal with cancer. Indeed, many of these cases are so close to the border-line as to render it difficult to arrive at a certain conclusion. The treatment of the case will frequently remove the doubt. Puncture of the cysts and the application of caustics cause cicatrization of the surface, and demonstrate that it is not malignant. It has been said that Nabothian cysts absolutely contraindicate the existence of cancer, but cases have been observed in which Nabothian cysts are filled with their secretion in the immediate vicinity of cancerous degeneration. The absence of tissue friable to the touch, the use of the speculum, and, when necessary, the examination of an excised piece should render the diagnosis of a benign condition positive.

Papillary erosion of the cervix is sometimes mistaken for a carcinomatous ulcer, but the latter is covered with friable tissue and bleeds easily. In carcinoma the affected structure is raised above the level of the healthy cervix; in erosion it is depressed. The latter has a regular outline, the carcinomatous ulcer an irregular, ragged line of demarcation.

Necrosis of a fibroid polypus is a condition in which the subjective symptoms are very similar to those of cancer. I recently saw a patient, a widow, forty-five years of age, who was suffering from a profuse menorrhagia, from a copious foul-smelling discharge, and had been assured by her physician that she was suffering from an inoperable cancer of the uterus. The appearance of the patient and the odor in the room apparently justified the assertion; but a digital examination revealed a large mass filling up the vagina, which was firm and resistant, and could be turned about from one position to another. The lower surface of the mass was somewhat roughened, but its upper surface was smooth. The finger, carried well over it, could reach a distinct pedicle, which could be traced upward to the uterus; the cervix was thinned, and at no place hard, indurated, or infiltrated; con-

sequently, I had no hesitation in assuring her that she could be relieved.

In necrosis of a fibroid situated within the vagina the diagnosis is readily made. The firmer resistance, the recognition of a pedicle, the absence of any infiltration about the external os, and the smooth outline render its character certain. When the growth is situated within the cavity of the uterus, however, it may be more difficult. Here a sloughing fibroid causes hemorrhage and a profuse offensive discharge, but the discharge is usually thinner, watery in character, and may contain particles of the growth. These particles are more in the nature of a slough. The uterus is larger in outline, the cavity of the organ is frequently open so that the finger can enter and come in contact with the mass which fills the uterus, and, by manipulation, occasionally fragments of the tissue may be broken off and examined under a microscope, or often under macroscopic examination the fibrous structure is recognized, which should exclude cancer. Dilatation of the uterus sufficient to permit the introduction of the finger discloses the cavity occupied by a mass which is more or less resistant, not friable, nor easily broken down.

Syphilitic Ulceration.—Syphilitic ulceration should be readily distinguished from cancer by recognition of the fact that it does not present an excavated surface with indurated base and edges, that it is associated with evidence of syphilis in other portions of the body, and by the absence of friable tissue upon the ulcerated surface. Microscopic examination to fix the diagnosis is generally unnecessary.

Partial Retention of the Products of Conception.—The retained tissues may be the embryonic envelope, a portion of the placenta, or blood-clots, which, when retained, are subjected to infection, cause an exceedingly foul-smelling and offensive discharge, and their presence is a frequent cause of bleeding. The history of recent abortion or delivery, the dilated os permitting the introduction of the finger, and the recognition of the retained products by exploration determine the condition. The retained products scraped away, a smooth surface is left, which is the normal uterine wall. The absence of further irritation following cleansing of the cavity demonstrates its true character.

Chorio-epithelioma presents a history of a previous abortion or labor within a few weeks or months, following which the patient suffers from profuse, irregular bleeding, which leads the physician to make a curetment in which there is a large amount of soft, friable tissue removed. This treatment arrests the hemorrhage for a very brief time, when the conditions recur, and a second curetment will disclose the fact that the structure found

in the first curetment had been re-formed. The disease shows a marked tendency to early metastasis through the blood-vessels. The disease occurs in patients at an earlier age than carcinoma. The age of the patient, the history of previous pregnancy, the severe hemorrhages, the rapid development, and its recurrence should lead to its diagnosis. The structure can be differentiated from cancer only by the use of the microscope. This reveals that the material is epithelial, but it differs from cancer in the absence of the well-marked stroma. In this respect it resembles sarcoma, but differs from it in the fact that it is composed of epithelial and not of connective-tissue cells. The further investigation discloses that this epithelium is the product of fetal life and originated from the covering chorionic villi, the syncitial cells.

Sarcoma causes symptoms similar to those of carcinoma. It may be differentiated, however, when it affects the cervix by the polypoid masses projecting from it, sometimes grape-like in form. Where the disease involves the body of the uterus, the organ is likely to become much larger than is the case in carcinoma. Sarcoma, however, is much more rare than carcinoma. The microscope affords the only means for arriving at a positive diagnosis. The structure of the sarcoma is homogeneous, and consists of connective-tissue cells, either round, spindle, or giant cells, without a well-defined stroma; they invade the walls of the blood-vessels and cause them to appear as mere sluiceways throughout the structure. In carcinoma the structure is nest-like with a well-defined stroma, the vessels are situated in the stroma and their coats are not destroyed.

It is seen that the existence of carcinoma does not preclude the possibility of pregnancy. The occurrence of this complication renders it important that we should study its course and be able to determine its presence. The diagnosis is rendered easier by comparison of the hard, firm, infiltrated carcinomatous parts with the softer, edematous, healthy tissue of the uterus in the pregnant condition. The carcinomatous nodules of the vaginal portion of the cervix may be recognized by touch, and often as intervening between the finger and the parts of the child. In some cases the initial stage of the malignant disease may be so slight as to be overlooked, and if the observer is in doubt as to the correctness of the diagnosis, a microscopic investigation of excised tissue should be employed. More difficult even than the recognition of carcinoma is the determination of the existence of pregnancy in the earlier months. Pozzi claims that it is impossible to diagnose the existence of pregnancy with uterine cancer prior to the fourth month. A number of cases are recorded in which pregnancy was first recognized during or following a total extirpation. It can thus be readily understood

why pregnancy can be overlooked in the second and third months. The earlier recognition of the condition is of extreme value, for observations have demonstrated the fact that the increased congestion which occurs in the uterus favors the more rapid development of malignant disease. It was formerly believed that the existence of pregnancy during cancer allayed or arrested the progress of the latter, to be accelerated subsequent to its termination, but careful observation has demonstrated the fallacy of this view. On the contrary, the increased nutrition which is directed to the uterus by the occurrence of pregnancy favors the more rapid development of malignant disease. The recognition of the existence of carcinoma, as determined by the microscopic investigation of the excised tissue and the simultaneous enlargement of the uterus, should cause the complication to be suspected.

571. **Duration of Cancer.**—The duration of life in this disease is hard to fix, because we know scarcely anything of its first beginning. We have no means of knowing how long a period transpires between its origin and the ulceration which produces the first symptoms for which the patient is induced to consult the physician. The form of cancer is also a determining factor. The soft, medullary cancer is rapid in progress and destructive in its action. The final catastrophe occurs much sooner than in scirrhus. The earlier in life the disease develops, the more rapid, as a rule, will be its progress. The period of survival varies, according to different authors, between six months and two or three years; in squamous-cell cancer, from three to four years; in cylinder-cell cancer, from one to two and a half years. A somewhat longer period is ascribed to cancer of the body. The normal duration of life can be materially altered by therapeutic measures. Cases are seen in which, after operation, months or years passed without any indication of relapse. This is true not only after radical operation, but the patient so improves after the arrest of hemorrhage and discharge by some palliative measure as almost to cause the patient and her friends to doubt the possibility of the disease being of so serious a character.

572. **Prognosis.**—It is only necessary that one should study the clinical course of carcinoma to be convinced that the prognosis must be bad. The improvement of the prognosis lies, first, in the early recognition of the disease; second, in prompt resort to radical operation. The first provision requires its recognition even before the characteristic symptoms of the disease are manifest. A patient in whom the irritative conditions favorable to the development of malignant disease exist should be kept under observation, and during the period of greatest susceptibility

should be subjected to a quarterly, at least a semi-annual, examination. Causes of special irritation should, as far as possible, be removed by appropriate treatment. Second, radical treatment should be understood as a procedure which will insure removal of the diseased structure within the limits of healthy tissue. Always to accomplish this, the operation must necessarily be early. The probability of rapid invasion of the deeper structure, and of the establishment of secondary nests more or less remote from the original site, is less marked in cancer of the body of the uterus than in that of the cervix or the vaginal portion. Cancer of the uterus in a woman prior to the age of forty years is more acute in its progress than in women of more mature years. The prognosis of the disease is materially affected by the thoroughness of the operative procedure and by the precautions which are exercised to prevent reinfection of the new wound. Our inability to determine when and to what extent metastasis has occurred renders us unable to fix the prognosis after operation with any degree of certainty in the individual case. An apparently hopeful one will soon relapse, and one for whom the outlook seems uninviting will remain for a long time relapse free, dependent upon obscure processes whose rationale we do not fully comprehend.

The outlook for length of life of the patient suffering from cancer of the uterus is affected largely by the occurrence of pregnancy as a complication. The prognosis of pregnancy depends upon the kind and the course of labor and upon the general condition of the patient; above all, upon the extension of carcinoma. The more difficult the labor, the poorer the general condition of the patient, and the more progressive the disease, the more certain will be the unfortunate result and probable death. The outlook of the woman suffering from cancer with a pregnant uterus is far worse than for the nonpregnant, because pregnancy and labor occasion extremely dangerous results. The rapid progress of the disease during pregnancy, the severe trauma during labor, and the rapid carcinomatous degeneration of the tissue affect the result. Chantreuil reported that in sixty pregnant carcinomatous diseased women twenty-five died during or shortly after childbirth. Cohnstein, in one hundred and twenty-six cases, saw seventy-two die. Hermann had one hundred and eighty cases in which seventy-two died. The uterine rupture alone had six victims out of Chantreuil's sixty cases; eleven out of Hermann's one hundred and eighty; nineteen out of one hundred and twenty-six women, according to Cohnstein, died undelivered—about 8.1 per cent. of all the cases. Under the uniform methods of treatment employed of late years, the mortality is somewhat decreased. It is now admitted that the treatment of

complications of pregnancy must be consigned to operative procedure, either gynecologic or obstetric. Formerly the treatment was limited to artificial abortion and premature labor. But little experience, however, was required to demonstrate that such measures were ineffective. The course then advised was to prolong the pregnancy as long as possible with a view to securing viability for the child, and the obstetric operation became the important consideration. Later experience in the various methods of treatment has led to the following conclusions: (1) In cases in which the cancer has reached a stage where radical operation is impracticable every effort should be made to prolong the pregnancy until the child becomes viable; (2) where the patient, however, is recognized to have the disease in its early stages, with a reasonable hope for successful removal, the ovum should not for a moment be permitted to prejudice the chances for the mother, and radical operation should be undertaken without reference to the child.

573. Treatment.—Our previous study of the anatomic structure and progress of development indicates that cancer originally consists of a primary nest, from which invasion of the surrounding structures occurs. The rational treatment, then, consists in the removal of the diseased structure within healthy limits. Upon the extent of involvement will depend our ability to remove completely the disease, and hence the division into two classes—*operable* and *inoperable*. The following scheme represents the methods of treatment which may be adapted to each class:

- (*A*) *Operable.*
  - 1. Partial extirpation, ... Vaginal.
  - 2. Total extirpation, ...
    - (*a*) Vaginal.
    - (*b*) Abdominal.
    - (*c*) Sacral.
  - 3. Palliative operations, ...
    - (*a*) Cureting.
    - (*b*) Caustics.
    - (*c*) Cautery.
- (*B*) *Inoperable.*
  - 4. Injections, ...
    - (*a*) Hypodermic.
    - (*b*) Cleansing.
  - 5. Anodynes.

574. (*A*) **Operable.**—(1) **Partial Vaginal Operations.**—As carcinoma uteri largely preponderates in the neck, it is quite conceivable that the early operations were directed to the extirpation of that section of the organ involved. Von Grafenberg, as early as 1600, reported that the uterus had been normally extirpated in a number of cases, but it is most probable that the majority of these were amputations of the cervix, particularly as the subsequent continuance of menstruation is noted in several women, and, indeed, the birth of children. In the early cases hemorrhage was controlled by styptics, and many of the patients succumbed to hemorrhage and sepsis.

Partial extirpation has remained, until the last fifteen years, the principal, if not the exclusive, operative method of combating carcinoma. It consisted in the removal of the diseased parts with knife or scissors, and the control of hemorrhage with the cautery or strong fluid caustic. The difficulty in controlling hemorrhage led to the employment of the chain or wire écraseur, by which the diseased tissue is crushed off. A marked improvement was the employment of the galvanocautery loop—the galvanic loops placed upon the cervix above the margin of the disease, tightened, and the cervix amputated. This procedure has been extensively practised by C. Braun and Byrne, with extraordinary results. The latter has made the procedure still more effective by substituting the galvanic knife for the loop.

Neither the employment of the écraseur nor the use of the loop can be considered as an ideal surgical procedure, for, with the first, injury of the neighboring organs can not always be avoided, and, with the second, it is not always possible so to place the loop that amputation of the vaginal portion of the cervix results with certainty in healthy tissue. A more progressive method was instituted by returning to amputation with the knife and union of the wound surfaces by sutures. The procedure was introduced by Hegar, who made a funnel-shaped incision. Schröder perfected supravaginal amputation of the cervix, a method capable of meeting all the requirements of the present partial uterine extirpation per vaginam.

Amputation of the Cervix with the Galvanocautery Loop.—The preparation for vaginal operation (Section 119) is made, exercising care to penetrate and disinfect the neck. The cervix is exposed with specula or retractors, seized with hook forceps which dip into the healthy tissue, and drawn upon, while the platinum loop is placed as high as possible, coming immediately under the transverse folds which indicate the position of the bladder, and is so tightened that it cuts into the tissue. As the excision progresses the vagina is protected from heat by wooden plates and syringed several times with water in order to thus cool the tissues and preserve them from burning. The wire must be kept at a red heat in order that the surfaces shall be well scorched. The wire should be tightened slowly until the cervix is cut through. When the operation is accomplished with due deliberation, there is no subsequent tendency to bleeding. The higher the wire is placed upon the cervix, the more probable it is that Douglas' pouch will be opened. The occurrence of such an accident, however, requires no more consideration than to pack the cavity with iodoform gauze. By the employment of the galvanocautery knife Byrne improved the operation. He cut around the

vagina, separated it from the cervix, and was enabled to remove the latter at a higher level.

Hegar's Operation.—The funnel-shaped amputation of the cervix described by Hegar is accomplished as follows: The cervix is fixed by double tenacula and drawn downward. A knife is introduced as far away from the limits of the disease as safety for the bladder and ureters will permit, and is carried about the cervix, held at such an angle as to cut out a cone-shaped mass, the apex of which would be high in the cervical canal. The hemorrhage is controlled by sutures and tamponade. Baker operated in a similar manner, but controlled the hemorrhage with the cautery, while Van de Warker cauterized the surface with zinc chlorid.

Schröder's operation is a supravaginal amputation, of which the following is a description: The cancerous portion is exposed by Simon's retractors. With a sharp curet all removable tissue is scraped away from the new formation until the curet reaches firm tissue, when the entire bleeding surface is scorched with a hot iron, the vagina being protected from the heat and frequently irrigated as the operation proceeds. The cervix is seized with a vulsellum and drawn downward as far as possible. An incision—if possible, one centimeter from the disease margin—is carried about the cervix; with the index-finger or a gauze pledget the bladder is bluntly separated from the anterior uterine wall. The bladder and ureters are thus shoved upward, when the anterior wall of the neck can be removed at a high level. In this operation Douglas' space is frequently opened, but the cervix is retained in connection with the lateral parametrium. The cervix is pulled to one side while with a Deschamps needle a ligature is passed as far away from the cervix as possible, tied firmly, and the tissue cut between the neck and the ligature. If the tissue is thick, a number of ligatures may be applied, one above another, and when the opposite side is likewise treated, the cervix is cut away. When necessary, all the cervix below the internal os can be removed. If Douglas' pouch is opened, the circumstance may be made useful in closing the parametrium, as the needle can be passed upon the finger, introduced through the opening. The cervix is then amputated at the level of the internal os. The section is made through the anterior vaginal wall to the cavity, and, before proceeding further, the anterior vaginal wall is stitched to the anterior cervical wall with from two to four sutures. The amputation is completed by cutting through the posterior wall, when the surfaces are sutured as in the anterior. A number of sutures are now applied to the lateral portions of the wound to insure closure. The sutures should be carefully

placed in the lateral angles in order to secure the uterine arteries. When they are ineffectually secured, hemorrhage may be free and threaten a fatal result. The patient can arise in from ten to twelve days and be discharged after from eighteen to twenty days.

The high amputation of the cervix has had many advocates, who champion it in preference to extirpation as being safer and less prone to subsequent relapse. The employment of the galvanocautery knife may produce a beneficial influence in the destruction of cancer nests which would be overlooked by the scalpel. An objection to the operation is that the cervical opening may contract and become closed, causing subsequent distress, and necessitate further operative procedure to relieve the dysmenorrhea or hematometra. Cases of pregnancy have been reported, but the difficulty in labor was so great, because of the scar tissue, that operative delivery was required and the patients died. Similar experience has been observed in the Hegar operation, owing to the difficulty in introducing the sutures. All these disadvantages are avoided by the Schröder operation.

The investigations of Seelig have demonstrated that infection has been carried through the lymphatics to the cervix, and even to the body, of the uterus. Such an occurrence would render anything less than extirpation of the entire organ of no service, and we have no means of determining when it has taken place. An additional reason for preferring the entire extirpation is that the cicatricial tissue is always irritable, and is a source of danger in a woman predisposed to undergo malignant change. The removal of the uterus and ovaries brings about a lessened congestion of the pelvic tissues, and will certainly leave the patient free of subsequent periodic engorgement of the pelvic structures. The cases suitable for the partial operation are infrequent.

575. Total Extirpation of the Uterus.—Isolated examples of total extirpation of the uterus have been mentioned as having occurred at various times during the eighteenth century, but it remained for Freund, by the abdomen, and Czerny, by the vagina, to formulate procedures which have led to the more complete and satisfactory methods of the present day.

Total extirpation may be undertaken in one of two stages of development: first, when no evidence of involvement of the parametrium exists, when the object is to eradicate the disease by ablation of the organ and of surrounding portions of vagina and parametrium, or to operate within healthy tissue; second, when there is some involvement of the parametrium

with fixation of the uterus. The latter operation is not curative, but may ameliorate symptoms.

In performing the radical operation two purposes should be kept in mind: (1) To keep beyond the confines of the disease by operating in healthy tissue; (2) protect the patient from any possibility of reinfection.

1. The recognition of the processes of development and the extension of cancer make it absolutely uncertain in any individual case that this purpose has been accomplished. The operator is absolutely unable to determine prior to operation that circulatory or irritative extension has not involved the parametrium beyond the safe limits of operation. In some this transmission may occur early in the disease, in others late, so that in a woman with but slight involvement and no demonstrable evidence of extension a favorable prognosis is usually given. However, not infrequently in these cases the physician is horrified to find a recurrence after a very brief period, while in others the entire vaginal cervix may be destroyed, and he operates radically, though only with a hope of amelioration, but the patient remains free from recurrence for years or even permanently.

2. The possibility of reinfection or of the transplantation of portions of cancerous structure upon a healthy wound and the reproduction of the disease from it is questioned. Such a view would seem a reasonable explanation for the redevelopment of cancer in a wound where microscopic investigation indicated that the operator was well beyond the confines of the disease. The opponent of infection, however, justly instances the possibility of metastatic nests in the parametrium, discoverable only by the microscope, from which the recurrence has followed. Such statements for the vicinity of the wound are difficult to combat, but if, in a single case, the disease can be transplanted to the abdominal wound in an abdominal hysterectomy, it should be considered proof that such reinfection may occur, for that region would be entirely out of the usual route for metastatic extension. Such an infection came under my observation in the practice of one of my colleagues, in a young unmarried but not childless woman. Within two months of an abdominal hysterectomy nodular masses were observed in the abdominal wound, which subsequently progressed. In two cases of my own experience transplantation has occurred. In both of these patients there was extensive involvement and obstruction of the cervix by a squamous-cell carcinoma. In the first patient a sinus remained in the abdominal wall following a stitch abscess, in which proliferation of the epithelium occurred. This resulted in a spreading

sore, involving the tissue circumjacent to the abdominal incision. As this patient had pelvic involvement as well, the possibility of continuous involvement must, of course, be considered, although I was apparently able to excise the infected abdominal tissue without opening the peritoneal cavity. The second patient, an unmarried woman, underwent operation June 19, 1900. The entire cervix was involved in a cauliflower growth to such a degree that her attendant, a surgeon of considerable experience, questioned the advisability of operation. She was exceedingly anemic and broken down by repeated hemorrhages. She had no control of nausea and vomiting for five days subsequent to the operation. At the close of the week it was found that all the sutures had cut through, the wound was gaping and the intestine protruding. The wound had been closed with silkworm-gut sutures for all the tissues above the peritoneum, and continuous chromic catgut for the latter and the aponeurosis. The intestines were packed back with gauze, and a week later the wound was closed with through-and-through silkworm-gut sutures under cocain anesthesia. The patient left the sanatorium five weeks subsequent to the performance of her operation, with good union in the abdominal wound. Much to the surprise of her attendant and myself she enjoyed, barring a very small ventral hernia, excellent health for over two and one-half years. Three months ago she began to have discomfort, and swelling in the line of the wound, and a lump could be felt which was thought to be a strangulated and inflamed projection of the omentum. However, the mass gradually increased in size and became painful, and, therefore, a provisional diagnosis of recurrent malignant disease was made. This was excised June 18, 1903, three years from the date of her previous operation. A mass of infiltrate as large as a hen's egg occupied the center of the cicatrix. The omentum and a portion of the ileum were adherent and had to be separated with scissors; a portion of the intestine was also involved in an annular band of tissue, for which three inches were excised and united by an end-to-end anastomosis. Careful examination failed to reveal any other evidence of the disease, the pelvis disclosed no sign of any infiltrate or glandular enlargement, although careful observation was made. It may seem that the two and one-half years which intervened before the development of this growth would argue against transplantation, but is it any more difficult to consider transplanted cells as lying latent and inactive in this area than those which have been transmitted to the parametrium to develop within the five years, a period which all authorities admit should transpire before a case can be pronounced as cured?

Whether we accept or reject the theory of infection, the precautions taken to prevent it are only such as will be of service in rendering the parts sterile and in preventing infection from pathogenic germs, which every one will admit are present.

Preliminary Treatment.—In every extirpation of the organ, whether by the vagina or the abdomen, in addition to the preparation indicated in Section 119, precautions should be exercised to remove all diseased and disintegrated tissue. The surface

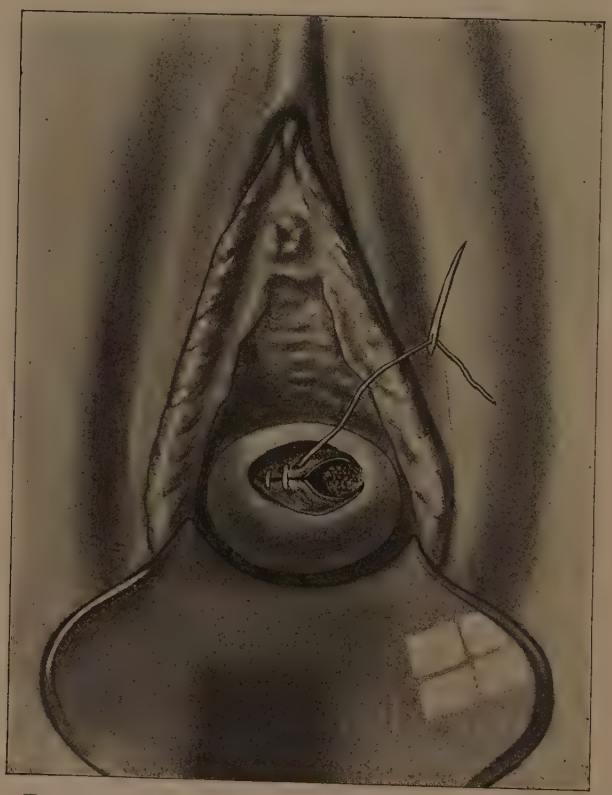


Fig. 493.—Formation of Flap to Cover Diseased Surface Preliminary to Operation.

should be gone over with a sharp curet, all loose and ragged edges trimmed with scissors, and the entire surface thoroughly scorched with the thermocautery. Sutures should then be placed to close up the diseased surface. If the entire vaginal cervix is more or less involved, incisions should be made upon each side which will permit flaps to be turned down and sutured over the diseased structures. The vagina should be continu-

ously irrigated during the process of closing off the diseased surface and carefully sponged with a solution of sublimate in alcohol (1:500).

576. Vaginal Hysterectomy.—Many isolated cases of extirpation of the uterus per vaginam are found in the literature of the last century, notably those of Langenbeck and Sauter-Recamier. Czerny, on August 12, 1873, revived the operation. The operation has also been variously modified. The following method should be pursued:

1. After the preliminary preparation directed (Sec. 119) place the patient in the lithotomy position, expose the uterus with an Edebohls speculum and lateral retractors, make traction upon the cervix with double tenaculum and vulsellum or a silk loop passed through it, draw it down as near to the vulvar orifice as possible, and close the cervix by sutures, making flaps where necessary to close in the diseased tissue. Sterilize the hands, and the instruments so far used.

2. Separate the cervix with scissors, knife, or thermocautery from the vaginal wall by an ovoid incision, extending it as far away from the diseased tissue as safety for the bladder and ureters will permit. This can be carried higher on the posterior surface without fear of injuring the rectum. The thermocautery knife has the advantage that it decreases hemorrhage and prevents immediate union, thus favoring better drainage.

3. Push back the bladder from the anterior wall of the uterus and from the broad ligaments. Where desirable to remove a large portion of the parametrium, expose each ureter and place upon it a traction ligature, as suggested by Bovée, when the uterine artery can be traced out and ligated near its origin.

4. The fundus of the uterus is turned down through the anterior vaginal fornix, the broad ligament seized upon the left side, crushed by the angiotribe, ligated in the groove, and the uterus separated. Repeat this process upon the right. Seize any bleeding vessels with hemostatic forceps and ligate them.

5. Unite the peritoneal surfaces with a continuous catgut suture, taking the precaution to secure at either angle the stump of the broad ligament. Cleanse the cavity and loosely pack the vagina with iodoform gauze.

All sutures should be of catgut, as silk is likely to become infected and produce a discharge and maintain a sinus until it comes away, which may require months, unless previously removed. Such a patient will be in constant apprehension that the disease is returning. The disposition of the ovaries and tubes will depend upon their situation and the extent of

the disease. If they are easily displaced downward, they should be removed; if high up, requiring considerable manipulation to displace them, they should be permitted to remain, as they cause no trouble. With the completion of the operation the wound should be carefully inspected for any bleeding vessels, as it is not impossible that a ligature may slip from the stump and a fatal hemorrhage result. Any bleeding points should be picked up and secured with separate ligature.

The treatment of the wound will depend on the condition of the patient. Thus, if the patient is very much debilitated and it is undesirable to keep her long under the influence of an anesthetic, the wound may be packed between the stumps with iodoform gauze, carrying the latter sufficiently high to prevent the intestine from coming in contact with the raw surfaces. The gauze packing is lightly placed in the vagina and the vulva covered with a pad. This packing, when the blood control has been complete, may be permitted to remain for from four days to a week. Upon its removal the cavity is irrigated with a 1:2000 formalin solution, and may be lightly repacked, although the packing should not be carried so high as the first portion. The anterior and posterior walls of the vagina are thus permitted to fall together and become adherent. If there is no tendency to displacement of the viscera downward and the belly of the patient is not distended, the gauze need not be replaced, but we subsequently content ourselves with irrigation. In relaxed vagina, or when the condition of the patient will permit of more time for the operation, the ends of the broad ligaments are preferably united and the stumps drawn well into the vagina; the sides of the vagina are united to each stump by a deeply passed suture, which, when tied, holds up the vagina and avoids its subsequent relaxation for want of support. The patient should be confined to bed for two weeks; frequently cases are permitted to rise earlier than this, but the long rest in bed is no disadvantage. The pelvic floor is firmer, and is less likely to be split and subsequently to prolapse.

Various modifications of the operation have been suggested. Three years after Czerny introduced it, Sänger was able to collect thirteen different methods of operating, and with each year subsequent various modifications have been suggested. Mikulicz was the first to use the curet. Billroth and Olshausen added scorching the surface with the thermocautery; others, in addition, cauterized with carbolic acid or chlorid of zinc, or used iodoform, liquor ferri chloridi, alcoholic bromin solution, and absolute alcohol. Tauffer made his preliminary preparations several days before the operation, and Leopold advocated

disinfection as the first step. Schauta began the operation with the thermocautery. Bottini, Wecchi, and Calderini amputated with the galvanocautery loop, and followed with extirpation. When cancer is situated high in the cavity of the uterus, antiseptic syringing is practised, the cavity packed with iodoform gauze, and the os closed over it with sutures or with clamp forceps. In order to limit the discharge of secretion in carcinoma of the body, Schauta introduced a tupelo tent into the cervix. This tent was somewhat constricted in the middle from perforation, and a thread was introduced, the ends of which were armed with needles. These needles perforated the cervical canal anteriorly and posteriorly, and the ends of the suture were tied over the end of the tent. The swelling of the tent acted as a plug to the cervical canal. Mackenrodt introduced the formation of flaps from the anterior and posterior vaginal surfaces, which we have described. Landau advocated an ovoid incision, the posterior surfaces somewhat higher than the front, as such an incision gave greater accessibility to the operation field. Doyen lengthens the circular incision by one right and left, in order to create a still larger opening, and especially to be able to separate about the bladder and the ureters more securely. Fritsch incised both sides of the vagina; the base of the broad ligament is cut and tied, so that in this manner the uterus is easily movable and readily drawn down before the cervix is separated from the anterior and posterior union. Schatz opens into Douglas' space; then the uterus is completely freed from its lateral union, and, finally, the bladder is separated from the cervix. The ureters have been injured in this method of operating. Billroth separates by degrees the broad ligament, ligates the individual vessels, and fastens the broad ligament in a properly prepared clamp forceps. Schröder drew the uterus through the opening of Douglas' space into the vagina. This procedure is not always performed with ease. Fritsch rotated the uterus through the anterior peritoneal opening. Olshausen operated with the uterus continually *in situ*, and endeavored to separate it first on that side which showed the least invasion by cancer. Corradi and P. Müller rendered removal of the uterus easier by dividing it into two portions by a sagittal section, and then removing each half singly. Kelly divides it into four or more. This procedure, without question, renders the removal of the uterus more easy, but if we believe in the reinfection of the wound, it greatly increases the danger. The ligation of the broad ligaments has also given great variety of procedure. Some ligate small sections; others ligate in mass. Olshausen, in the beginning, attempted to surround the broad ligament with a

single ligature, but the sloughing stump would slip out from the ligature and considerable hemorrhage result. Liebmann attempted to ligate the parametrium in such a manner that the ligature is knotted on the vaginal mucous membrane in order to limit its slipping. The superior part of the broad ligament, with the spermatic vessels, repeatedly slips from the ligature and requires supplementary ligation, which is accomplished with great difficulty. Veit fastens the superior part of the stump with hook forceps and ties the ligament behind them.

With regard to the removal of the ovaries there has been considerable discussion. Czerny, in his first case, removed the appendages supplementary to the removal of the uterus. Schröder, Olshausen, and others leave them when no indication of disease is found. Von Teuffel and Kaltenbach urge their removal; the latter emphasized the possibility of infection of the peritoneum by leaving inflammatory diseased portions of the tube. The retention of the appendages in carcinoma of the uterine neck is not found to favor the appearance of relapse. The course of the lymph-channels arising from the cervix has no relation to the appendages of the uterus. They should always be removed whenever pathologic alterations are recognizable. After Reich, in several cases of carcinoma of the body, had demonstrated cancerous disease of the ovary, the removal of the appendages was advocated in all cases, in this form of uterine cancer. Formerly surgeons employed irrigation freely with strong antiseptics during the early part of the operation. To-day, the majority of gynecologists, after radical disinfection of the field of the operation, proceed with sterilized instruments without irrigation. Irrigation should be employed only when necessary to cleanse the field, and it is better then to use nothing stronger than normal salt solution or a 1 per cent. saline solution.

The vaginal operation will be especially difficult if the canal is narrow and rigid or the uterus very large. Under such circumstances the majority of operators have incised the vaginal wall or the paravaginal tissue, by which procedure the lumen of the vagina is considerably increased. Von Winckel, in one case with enormous narrowing of the vagina and a large uterus, split the entire rectum and rectovaginal septum up to the vaginal vault. The large vaginorectal wound was sutured with silk, and recovered by primary intention. Duhrssen made a deep vaginal incision, which penetrated from the vaginal vault and completely opened the ischiorectal cavity and the entire vagina. Section on the right side penetrated the vagina, and also the rectum, to the depth of six or seven centimeters. By this

incision not only the vaginal tube, but also the surrounding muscular structure, the levator ani, and the constrictor cunei are separated. The direction of the incision is in the middle line, between the tuber ischii and the anal opening. By such an incision the entire field of the operation is incidentally increased, and the resistance of the soft parts of the pelvic cavity is removed. The hemorrhage from the vagino-intestinal incision is either controlled by ligature or through pressure of retractors. After the removal of the uterus the wound is closed by sutures. After such an incision relapses have occurred in the scar tissue, which are evidently infection relapses. Schuchardt creates a still larger accessibility to the field of operation by opening more widely the ischiorectal cavity. He makes two accessory incisions. One splits the entire lateral vaginal wall, from below to the neck; on the other side a long vaginal incision from behind progresses to the sacrum, and encircles the rectum bow-like, in an incidental sagittal section. The long incision is made upon the side in which the parametrium is strongly involved, and extends to the outside of the convex bow at the side of the anus. The extirpation of the uterus in these operations differs from the usual vaginal extirpation only in that the parametrium has been opened up so that some cancerous nodules can be removed therefrom without exposure of the ureters. The vagina is closed from above downward by knotted suture.

While it is without question that these extensive vaginal incisions afford greater freedom in our manipulation of the uterus, the ease with which the uterus can be reached from above would seem to contraindicate such a method of procedure, but much more by the increased danger of reinfection of the parametric tissue that must be associated with it. In order to be able to remove larger portions of the parametrium with safety Pawlik, Kelly, and Clark introduced catheters into the ureters to render their position more definitely determined and to permit with safety the removal of larger portions of the endometrium. The ureters can be dissected out as suggested by Bovée; the catheter in one case was broken off, and the patient died. Its employment inflicts more or less trauma and, therefore, predisposes to infection. Mackenrodt, in total extirpation, cuts about the vagina some distance from the portio and prepares anterior and posterior flaps, which are drawn over the portio and sutured so that the diseased tissue is completely covered. He splits the anterior vaginal vault by a median incision from the urethral swelling to the circular incision. The accessibility of the operation field is still further increased by a deep vagino-intestinal incision. The bladder

is dissected from the cervix, and especially from the broad ligaments, and therewith the ureters are separated some distance; and, finally, the uterus, with as large a portion as possible of the parametrium, is extirpated. The peritoneal wound is closed after the contraction of the stump, the vagino-intestinal incision narrowed by suture, and the vagina, with the supravaginal wound, packed with iodoform gauze. Later, Mackenrodt performed an operation in which the extirpation of the uterus and of the greater part of the vagina was accomplished with the hot iron. He believes that a larger extent of the vagina must be removed than is customary, because we do not know that a latent contact infection of the vagina does not already exist. He performs the operation as follows:

With cutting instruments, Paquelin cautery, or galvanocautery the entire vagina, or at least the upper half of it, is separated; a vaginorectal incision is made which extends to the portio and lays open the operation field; then the vagina is seized with forceps and separated downward by hot iron. If the upper part of the vagina only is removed, we begin with a circular incision in the middle of the vagina. After extirpation of the vagina the portio is secured with forceps and Douglas' cavity is opened with a hot iron. The bladder and the broad ligaments are separated from the cervix by a properly constructed shovel forceps, drawn as far as possible to the outside, and separated by the cautery. After the separation of the base of the broad ligament of both sides spurting vessels are seized with Koeberle forceps, which are placed in the higher part of the broad ligament, separated by the cautery, and the stump scorched. The now very movable uterus is easily inverted. The upper parts of the broad ligaments are fastened with Richelot's clamps and a ligature is placed on each side, after which the separation of the stump results. After the removal of the uterus the rectovaginal incision is closed by sutures, when, in spite of the scorching, primary union is usually obtained. The perineum is not sutured. The burned cavity is filled with iodoform gauze. Elevation of temperature follows. Of ten cases subjected to this operation, two suffered from sepsis.

Byrne has removed the entire uterus by the galvanocautery, but used the knife instead of the loop. Winter and Frommel combat the possibility of the danger of contact infection of the vagina being great enough to justify such a procedure. Czerny, Franck, and others have pursued the method suggested by Langenbeck of separation of the uterus from its peritoneal envelope, and the several resulting tears in the peritoneal covering were united by sutures. This operation is sometimes very

easily done, but in others is extremely difficult. Richelot and Péan advocate the use of clamps instead of the ligature. The preliminary steps of the operation are performed similarly to those already described. After opening the peritoneum in front of and behind the uterus, the organ is held by the broad ligaments, through which enter the uterine and ovarian arteries. Clamp forceps are applied at each side of the cervix, upon about one-half of the broad ligament, and the structure is cut between the cervix and the clamp. The uterus is drawn down, if preferred, and the fundus is brought forward and through the anterior fornix; clamp forceps are applied from above upon the remaining portion of the broad ligament. The section between the clamp and the uterus frees that organ, which can be removed. The clamps are then held apart, the surfaces are separated by retractors, and careful inspection is made to determine that all bleeding vessels are controlled. Any spurting vessels should be secured with smaller clamp forceps or the arteries should be ligated. The clamps are held apart and iodoform gauze is carried into the vaginal canal between them to the point at which the peritoneum has been separated, and is loosely packed between the clamps. The gauze should be carried over the end of the clamps, so that the coils of intestine shall not impinge against them and become injured. The operation has the advantage that it can be performed very expeditiously, and requires much less time than the application of the ligature. It has the disadvantage that the tissue within the grasp of the clamp undergoes sloughing, causes a foul discharge, an offensive odor, and sloughing tissue which endangers the infection of the peritoneal cavity. The convalescence of such patients is usually attended with considerable elevation of temperature.

Tuffier reports twenty-seven cases of vaginal hysterectomy without the use of forceps or ligatures. The uterus was bisected, one-half drawn out of the vulva, the finger passed behind the upper part of the broad ligament, and the included tissue grasped between the blades of a powerful clamp, the angiotribe, which is tightly screwed. The tissues are thus crushed and the artery is occluded. After the crushing of the tissues the ligament is cut through and the upper part of the broad ligament crushed in a similar manner. It is very important that the handle should be secured as tight as possible and the blades kept in the axis of the vagina. In none of the cases reported had any accident occurred during the operation, and absence of hemorrhage was particularly noted. This procedure is also advocated quite strongly by Dr. Newman, of Chicago. Dr. Downes, of this city, has greatly improved upon this method by the use

of electro-hemostasis. The late Dr. Joseph Eastman placed the patient in the Sims position, stretched the anus to allow greater readiness of access to the pelvic cavity, retracted the perineum with a Sims speculum, and made an incision about the uterus, which opened the Douglas culdesac posteriorly and between the bladder and uterus anteriorly. He then passed a curved staff over the broad ligament by which a ligature was carried and the broad ligament secured *en masse*, then over it was passed a pair of interlocking forceps by which the broad ligament was constricted, preliminary to its being severed, after which the ligament could be ligated in sections or the clamp permitted to remain. The other broad ligament was treated in a similar manner. The advantage he claimed for this procedure was greater security and control of hemorrhage, and that the vagina was held at a lower level and its prolapse prevented. The position of the patient, with the preliminary dilatation of the anus, gives greater freedom of access to the uterus.

577. Accidents of Vaginal Total Extirpation.—The most frequent injury is that of the bladder, which can take place in various ways. Thus, it may occur in the blunt separation from the anterior cervical wall. The danger of this becomes the greater, the more closely the new formation has approached the bladder. If it has passed over on to the external layer of the bladder-wall, we may very readily puncture the bladder in the most careful separation. When the bladder is infiltrated, the preferable plan is to cut out the diseased tissue and close the opening by sutures. Injury of the bladder is recognized, however, most frequently for the first time at a longer or shorter period after the operation, when a part of the urine is lost through the vagina. Either a small bladder injury has been overlooked, or, what is probably more frequent, the bladder has not been sufficiently separated from the ligament, and in placing the ligatures upon the parametrium a portion of it is fastened in the ligature, so that a slough of the affected bladder-wall occurs. A spontaneous closure not infrequently results from the scar retraction. When it has not closed, the repair of the fistula must be undertaken by operation. Kaltenbach claims that injury of the urinary apparatus occurs in about 10 per cent. of all cases; this, for the last few years, should be too high. An *injury of one or both ureters* is occasionally observed. The injury can be avoided if the bladder and ureters are well pushed back. It does not require the previously mentioned sounding of the ureters to avoid ureteric injuries. One should exclude cases from operation in which the parametrium and the surroundings of the ureter are infiltrated with carcinoma. In such

cases the shoving back of the ureter is exceedingly difficult, and not infrequently is associated with injury. The most serious injury of the ureter consists in the application of a ligature upon it. Ligation of both ureters is, without question, fatal, and the ligation of one manifests considerable injury. Schatz does not believe the ligation of one ureter necessarily unfavorable, as the other kidney performs increased duty. He also believes that in one case after ligation of the ureter the canal again became penetrable a few days later. A number of operators have had to remove the corresponding kidney as a result of the ligation of the ureter. Zweifel, in double-sided ureteric ligation forty-eight hours after the operation, loosened the ligatures on the one side, and the strongly swollen ureter was made accessible again to the bladder; but as urine retention continued six days after the operation, the ligature on the other side was removed and the restoration of the ureters attained.

Injuries of the rectum are much less likely to occur. They result only from especially unfavorable relations, as in adhesions of the rectum to the uterus. Frommel reports a case in which, in an attempt to open Douglas' space, the adherent rectum was injured, and, in spite of the most carefully introduced sutures, he lost the patient from septic peritonitis. In rare cases communication between an intestinal loop and the vagina, with involuntary fecal discharge, has occurred, most generally from relapse in the operation scar, by which the carcinoma extends upon an adherent loop of intestine. Numbers of cases are reported in which ileus results from adhesions in the open peritoneal wound. In symptoms of ileus the intestinal loop should be separated from the vagina after opening the wound. If this fails, an artificial anus should be made or the affected loop of intestine should be resected.

578. Abdominal Hysterectomy. –The first systematic operation for the removal of a uterus for malignant disease through an abdominal incision was performed by W. A. Freund, on the 30th of January, 1878. The operation has undergone a number of modifications since its introduction by him. After preliminary preparation (Sections 110 to 120) the operation is performed as follows:

1. The patient is placed in the lithotomy position, the friable tissue is removed from the cervix with the finger and spoon curet, all loose and ragged edges are trimmed with the scissors, the surfaces seared with the thermocautery and the lips sutured to close in all infected tissue. Where this cannot otherwise be accomplished, flaps should be dissected up. Before proceeding further, the hands and instruments should be resterilized.

2. The patient is placed in the Trendelenburg posture and an incision made in the median line from three centimeters above the symphysis to a short distance below the umbilicus, through which the intestines are pushed toward the diaphragm and walled off by gauze.

3. The uterus is secured by a double tenaculum and vulsellum forceps or sutures which have been passed through the fundus, drawn up, and each broad ligament clamped, one blade of the clamp being passed through the ligament in such a way as to secure the round ligament.

4. Cut the broad ligaments internal to the clamps, secure bleeding from the uterine side by hemostatic forceps, join the extremities of the broad ligament incision by one through the anterior peritoneum above the bladder, and strip it and the bladder away from the cervix and broad ligament.

5. Find and secure the uterine artery upon each side with hemostatic forceps and cut between them and the uterus.

6. Tilt the uterus to one side and open into the vagina, making sure the opening is well below the infected area. Through this opening the cervix can be followed around and severed from the vagina.

7. The clamped vessels are ligated, the uterine by simple chromic catgut ligature, the ovarian *en masse*, after being crushed with the angiotribe.

8. The surface is carefully inspected for bleeding vessels and infected glands, the peritoneal folds are stitched over the vagina with a continuous chromic catgut suture, inverting all ligated stumps into the vagina.

9. Remove all gauze pads, cleanse the pelvis and close the abdominal wound, cleanse and apply dressing. Where the conditions make it desirable, after stripping back the anterior peritoneum and bladder, the broad ligament can be spread out, the uterine artery traced outward and ligated near its source, the ureters raised, held to one side by traction ligatures, and a larger portion of the parametrium removed.

The vaginal opening can be packed from above with iodoform gauze, an end of which is carried into the vagina, while the portion above covers the injured surfaces and prevents the contact of intestines. This gauze should be permitted to remain from four to six days, until the peritoneal surfaces have been closed over the vagina, and have made it an extraperitoneal surface. Some surgeons prefer to suture the peritoneal flaps, and loosely pack the wound from the vagina with iodoform gauze.

In Freund's first procedure the broad ligaments were ligated external to the appendages, a second ligature was placed on the portion of the broad ligament which included the round ligament,

and a third secured the base of the broad ligament by being introduced from the vagina through a trocar needle which Freund devised for the purpose. The last ligature was tied upon the base of the ligament as firmly as possible. In this way three ligatures were inserted, one under another. The other broad ligament was secured in the same manner. The peritoneum above the bladder fundus was cut transversely upon the anterior uterine wall. A similar section was made upon the posterior wall, somewhat lower, and these wound margins were united with a silk loop after the removal of the uterus. The uterus was separated by knife or scissors. Hemorrhage from small vaginal arteries was controlled by ligation. All the ligatures were carried into the vagina, and by traction the stump was drawn down. This dragging made the peritoneum of the bladder approach that of the posterior wall of the pouch of Douglas. These two walls could be united by continuous catgut suture. A most careful toilet of the peritoneum was accomplished, the eventrated intestines were returned, and the belly wound was closed with sutures. The sutures that were pushed into the vagina could be removed by traction at the end of three weeks. The greatest danger of the operation was infection of the peritoneal cavity.

This operation has undergone various modifications. Credé proposed to resect a part of the anterior pelvic wall several days before the operation, but found no imitators. A. Martin made a moon-shaped abdominal incision from the one anterior superior spine to the other, by which he hoped to be better able to keep the intestines in the abdominal cavity. He has not continued the procedure. The separation of the bladder from the uterus prior to the introduction of the base sutures has been a great improvement, decreasing the danger of injury of the bladder and of ligation of the ureters. Simpson, of New York, was the first to isolate and tie the uterine artery. Kuhn raised the uterus by means of the colpeurynter in the vagina, and made it more accessible. Eastman accomplished the same thing by a grooved staff through the posterior vaginal fornix. Bardenheuer advocates leaving open the peritoneal wound for drainage, but his results were not such as to make the plan acceptable.

Modifications of the operation are, first, to make an incision through the vagina around the cervix; pack the cavity with iodoform gauze and complete the operation from above. Another is: separate the front and back, open into the vagina, and complete the operation by the application of clamps to the broad ligament. Veit operated by ligating and cutting the broad ligaments as far as the vault of the vagina; then he completed the operation through the vagina. Gubarroff, of Moscow, advocates the ab-

dominal procedure, because of the impossibility of the removal of lymph-glands and the tissue at the base of the broad ligament in vaginal total extirpation.

In marked involvement of the cervix Rumpf proceeded by the following plan: He ligated the broad ligament above, opened up the parametrial connective tissue, and proceeded to expose each ureter in its entire course from the psoas muscle to the bladder; thereby the uterine arteries were severed and ligated, and the parametrial tissue could be removed bluntly nearly to the uterus without incidental bleeding. Subsequently, the anterior leaflet of the broad ligament was cut through, the peritoneum over the surface of the bladder divided transversely, and the latter bluntly separated from the cervix. The parametrial tissue beneath the ureter could be still further removed. The vagina was separated by means of a Paquelin cautery, after the removal of the uterus, was filled with iodoform gauze, and the peritoneum was closed over the rest of the broad ligament. Rumpf reports a case operated upon in this manner which remained free from relapse for over two years. This same procedure has been followed by Clark and Kelly, who introduced fine bougies into the ureters to render them perceptible.

Ries advocates the removal of the lymphatic glands on account of their being the source from which redevelopment occurs. He operates in the following manner:

1. Through the vagina he amputates the portio vaginalis and tampons with iodoform gauze.

2. Through the abdominal incision from the symphysis to the umbilicus he ligates the ovarian artery in the infundibulopelvic ligament near the pelvic wall, and splits the peritoneum over the common iliac, exposes the vessel by blunt and sharp dissection until the bifurcation is exposed, when the ureter is separated as far as the bladder.

3. The broad ligament is ligated toward the pelvis in sections and the part toward the uterus is secured with clamps. The bladder is separated bluntly from the surrounding broad ligament and the uterine artery tied peripherally.

4. The collected fat tissue with the glands is removed from between the large vessels, the external and internal iliac.

5. The vagina is opened, the uterus removed, and the vaginal canal filled with iodoform gauze, while the peritoneal flaps are united with continuous silk suture and the belly cavity completely closed.

When infection is so great as to require so extensive a separation, the danger from sepsis and from relapse of the disease is so marked as to render the operation of questionable value. Werder, of Pittsburg, in order to lessen the danger of wound

reinfection, does an abdominal hysterectomy in which he ligates the broad ligaments, pushes off the vagina with the bladder, not only from the anterior surface of the uterus, but from the anterior portion of the vagina for one-third to one-half its length. The tissues are also separated from the vagina posteriorly and laterally, the abdominal wound is closed by a previously introduced suture or hooked forceps; the uterus is then drawn through the vaginal outlet and the remaining portion of the operation completed by the vulva, which saves the wound from contact with the infected portion.

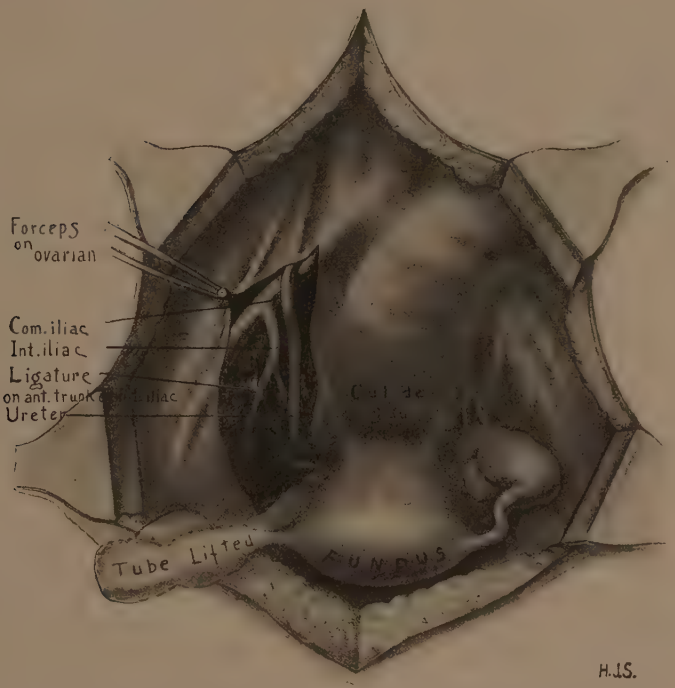


Fig. 494.—Ligation of the Anterior Trunk of the Internal Iliac.

In order to control hemorrhage in an extensive dissection of the pelvic structures, Polk advocated ligation of the anterior trunk of the internal iliac artery (Fig. 494). The distribution of vessels from these trunks is, however, somewhat irregular, the vessel itself is short, and the structures supplied by the posterior trunk are so bountifully nourished by anastomotic vessels that in two cases I tied the internal iliac vessels, which permitted a most extensive dissection free from bleeding. In both these cases the involvement of structures was so extensive that the operation

was of doubtful utility. The first patient survived the operation and returned home, but soon perished from a relapse; the second case developed tetanus at the end of ten days after the operation, from which she died.

Schröder, after ligation of the infundibulopelvic ligaments and the portion of the broad ligaments containing the uterine arteries, amputated the fundus at about the level of the internal os. After bleeding vessels had been secured and the stump dissected out, the vaginal surfaces were united, over which the peritoneal flaps were sutured. The operation is objectionable because of the danger of reinfection. Mackenrodt urges not only the removal of the glands of the pelvis, but also an extensive removal of the parametric tissue, since in the latter, metastatic nests were most frequently found, which were the chief cause of recurrence. In order to accomplish this most effectively, he advocates the following procedure:

1. A large crescentic abdominal incision from one iliac spine to the symphysis and upward to the opposite is made, through which insertions of the recti muscles are divided without opening the peritoneum, and the abdominal muscles are separated from the pelvic attachments.

2. The peritoneum is pushed off to its reflection over the anterior wall of the bladder, when it is cut through and pushed behind the uterus.

3. The uterus is drawn out and the ovarian arteries ligated in the usual manner. The peritoneum is then sutured behind the uterus from the right side of the pelvis across to the left, covering the sigmoid flexure, which permits the subsequent steps to be extraperitoneal.

4. The pelvic peritoneum is dissected up as high as the iliac vessels, where the glands are found and removed with fat and connective tissue. During this stage the ureters are carefully protected.

5. The bladder and rectum are separated, the entire vagina freed.

6. The broad ligaments and paravaginal tissues dissected out, the vagina clamped and divided with cautery below the clamps.

7. The space between the bladder and the abdominal wall is drained through the lower angle of the external wound. The divided recti are united by silver wire sutures and the abdominal wound closed. Considerable suppuration is usually expected between the bladder and the rectum.

579. Comparative Advantages of the Two Proceedings.—The principal danger of the abdominal procedure arises from septic infection. The investigations of Menge and others have demonstrated the presence of pyogenic germs in the discharges of

uterine cancer. The much longer duration of the operation, the increased exposure to infection, and the lessened powers of resistance favor its development. In the vaginal procedure the peritoneum is less exposed to infection, and the operation can proceed without any, or with scarcely any, soiling of the peritoneal cavity. In our present methods of procedure the operation is more expeditious; with the separation of the bladder from the cervix of the broad ligament, the uterine artery can be ligated without danger to the ureter.

The Freund operation presents greater oversight of the operative field than is afforded by any other method.

The claim for the abdominal procedure, that it permits the extirpation of the lymphatic glands, is of but little significance when we remember that the glands are rarely involved until very late in the disease; and when the disease has extended to the lymphatic glands of the pelvis, the operation is but little better than a mutilation, for it will scarcely have any influence upon the subsequent progress of the disease.

Notwithstanding the vaginal operation can be done much more expeditiously and with less danger to the patient, with less discomfort during the convalescence, it can not be denied that in cancer of the uterus where the disease is confined to that organ, the abdominal operation should be preferred. This preference is granted it, not because it permits us to extirpate the lymphatic glands,—for I believe that no operator is sufficiently skilled to make sure that all the lymphatic glands are removed, and even if they were, the extensive lymphatic system would still afford opportunities for the retention of infection,—but because it enables the operator with greater safety to remove the parametrial tissue. The large number of cases in which vaginal hysterectomy has resulted favorably, the fact that where recurrence takes place, it is in the cicatrix, in the vaginal wall, or in the parametric tissue, leads me to believe that the assertion regarding the infrequency or lateness of lymphatic gland infection is correct, and that where the disease has resulted in the involvement of the glands no operation affords much hope of cure. In cases in which it is evident that the disease has extended outside the uterus and the operation is done for its palliative effect, removing only the infected tissue, the vaginal operation may be preferred, where the vagina is large and roomy, and the uterus not unduly large.

A narrow contracted vagina, a large or fixed uterus, extensive involvement and destruction of the cervical walls, which afford no firm tissue to be seized, and more or less fixation of the uterus from inflammatory lesions, render the vaginal procedure very difficult. Complications of the diseased uterus with abdominal

growths, such as myoma, ovarian tumors, and extra-uterine pregnancy, should be attacked through the abdomen. When we come to the duration of after-results, the advantage seems to favor the abdominal procedure.

Injuries of the ureters occur less frequently by the abdominal route, but the operator in all cases of extensive involvement of the parametrium should ascertain the position of the ureter by following it down from above before blindly applying a ligature. Through neglect of this precaution I have twice ligated a ureter. If the ureter is unavoidably or accidentally injured, an attempt may be made to unite it by suture, as was done by von Tauffer and Westermark, or the ureter may be implanted in the bladder.

In extensive parametrial involvement, where the infiltrate surrounds the uterus, I have in three cases cut through the ureter, dissected out the involved structure to the pelvic wall, and reinserted the ureter into the bladder at a higher level. In all of these patients the ureter was distended to the size of a finger as a result of compression from the infiltrate. All recovered from the operation, but two succumbed some months later to recurrence of the disease, and in the third patient operated upon, three months since, the disease has recurred. Küstner, when unable to accomplish a vesical transplantation, formed a vesico-vaginal fistula; then performs a colpocleisis in preference to a nephrectomy.

580. The Sacral Method.—Kraske, in 1885, introduced an operative procedure, under the title of the sacral method, for the purpose of extirpating the upper part of the rectum for carcinoma. It consisted in resecting the rectum after the removal of the coccyx and a portion of the sacrum. Hochenegg, in 1888, after a series of brilliant successes, adapted the operation to the treatment of some of the disorders of the female sexual organs, and the following year reported the application of the method to the removal of the uterus. The operation was performed as follows: The patient was placed in the Sims position, with the pelvis slightly elevated, an incision was made from two to three centimeters above the right sacro-iliac synchondrosis to within one centimeter of the left side of the anus. After cutting through the skin and fascia, the under part of the sacrum and the entire coccyx were exposed. Now follows the bone operation. If the coccyx is large and broad, its removal is sufficient; otherwise, a portion of the left sacral wing is also resected. If a part of the sacrum is to be removed, we cut through the sacrosciatic ligaments, and with a rongeur cut away the left side of the lower two segments of the sacrum. The prevertebral fascia is split the entire length of the wound; the now free-lying rectum is bluntly separated on the left side

and displaced to the right. Later experience demonstrated the advisability of opening upon that side of the rectum on which the parametrium was most infiltrated. The rectum is shoved aside and Douglas' space opened by a transverse incision, which is recognized as the hardest part of the operation. One or two fingers are introduced into the opening, the uterus and its appendages are explored, and the practicability of their removal is determined.

Fig. 495.—Skin Incision for Sacral Resection.

In removal of the uterus it is seized and drawn through the incision of Douglas' space into a position of strong retroflexion. The broad ligaments upon both sides are cut between double ligatures; when the uterus becomes so movable that it can be further drawn down, its anterior surface is inspected. The peritoneum above the vesico-uterine reflexion is cut transversely, and, together with the bladder, pushed downward. The uterine arteries are generally ligated under the eye, and

the ureters easily pushed aside, although they have been injured. After the separation of the lateral appendages the organ remains in union only with the vagina. A transverse incision through the peritoneum in front of the uterus is made, which is separated and sewed to the peritoneum of the anterior wall of the rectum. The vagina is closed in two stages. Iodoform gauze is packed about the remaining portion of the wound and brought out at the center of the posterior wound, both

Fig. 496.—Sacrum Resected; Rectum Exposed.

ends of which have been closed. This operation was extended by Herzfeld, who found that, in the majority of cases, only the removal of the coccyx was required. He penetrated the right side of the rectum, for the reason that the vagina is situated more to the right, is more accessible, and there is less interference with the rectum. The transverse opening is made in Douglas' space, the right and left broad ligaments are tied

and cut, after which follows a complete closure of the peritoneum before further extirpation. There is no possibility of soiling the peritoneal cavity by contact with cancer. The rectal peritoneal surface is sewed to that of the bladder and the stumps are fastened in the wound laterally, making them extraperitoneal. Hegar cut transversely in the anterior uterine wall above the bladder fundus, and shoved back the bladder and ureters. The remaining removal of the uterus is similar

Fig. 497.—Rectum Pushed Aside; Uterus Exposed.

to that described in Hochenegg's and Herzfeld's operation. Schede protests earnestly against sacrificing the sacrum. In a large series of operations he never found it necessary to remove enough of the sacrum to involve the lower sacral foramen and its nerve. He designates the removal of the lower two sacral nerves a crime, as the destruction of these nerves paralyzes the detrusor vesica uterini and causes a very severe in-

flammation of the bladder, which increases the distress and peril of the patient. Zuckerkandl introduced a still more conservative method, in which there was no bone resection. Skin section was from the left side of the tuberosity of the ilium until midway between the end of the coccyx and the anus. At the sacral margin it formed a bow bent hard to the right. The gluteus maximus muscle, the sacro-iliac and sacro-sciatic ligaments, the musculus coccygeus, and part of the levator ani muscle were cut through at the margin of the sacrum and coccyx. The rectum is set free and the operation proceeded with as previously described.

Wolffler places the skin section to the right of the sacrum, over the somewhat narrowed part at the union of the coccyx and sacrum; the section forms an easy curve, with its concavity to the right, and ends near the rectum, in the neighborhood of the vulvar commissure. The gluteus maximus and the levator ani are cut near the rectum, and the deeper structures become accessible. Zuckerkandl designated his and Wolffler's methods as parasacral section. These operations are more bloody, because the sacral, the median, and the inferior hemorrhoidal arteries, and the pudendal artery and vein are in the range of the incision. Hegar made an osteoplastic resection of the sacrum and coccyx. A V-like incision, with the arms beginning one centimeter beneath each inferior posterior iliac spine, converged to the point of the coccyx. After separation of the soft parts and bands near the sacral margin the rectum was bluntly separated from the anterior sacral surface, a chain-saw was introduced between the third and fourth sacral openings, the sacrum cut transversely through to the posterior periosteum, which was retained, and the sacral part turned up. After the operation this flap was returned to place and secured by sutures. Consolidation usually took place in a very short time. In two cases necrosis resulted, and the flap had to be removed. After the operation the skin wound was closed, with the exception of a small drainage opening, and the advantage of the procedure is that the anatomic relations are exhibited as before. This osteoplastic resection of the sacrum is applicable to the removal of carcinomatous uteri as well as retro-uterine tumors.

Kocher and Heinecke recommend the splitting of the sacrum in the middle and the separation of the sides from one another. Levy and Schlange, in opposition to Hegar, turned the flap toward the anus, while Rydygier made the incision in the soft parts on one side, and, after transverse incision, turned the sacrum toward the other side. Borelius changed this method in the removal of a carcinomatous uterus as follows: He began

with the skin section in the middle line, about two centimeters above the sacrococcygeal articulation; then, somewhat to the left, approached the point of the coccyx forward, through the rectosciatic fossa, three to four centimeters from the anal aperture; from this point he progressed forward, and again approached the middle line until led to the posterior commissure. After laying free the left border of the coccyx, the sacrococcygeal angle is cut through. The skin section, in its entire length, is sufficiently deepened, and the coccyx, together with the anal portion, is held to the right; after separation of the rectum we can proceed from the posterior vaginal wall to the extirpation of the sexual organs. After the operation the coccyx is replaced and fixed with periosteal sutures.

Various modifications of Hochenegg's procedure for the extirpation of the uterus have been introduced; by proceeding, as Herzfeld suggested, to the right of the rectum, Douglas' space will not be missed. In the search for the space—made incidentally easy by having an assistant introduce the finger into the rectum to indicate the plica transversalis recti, as the cup of Douglas' space always lies at the height of this fold—we only need to make the incision to enter the space. The difficulty in finding Douglas' space has occasioned the majority of operators to renounce the primary opening in the peritoneal cavity entirely, and to proceed to the extirpation of the uterus by the opening from the vagina.

Incidentally an easy way of accomplishing the uterine extirpation would be to follow the proceeding of Czerny, who from the vagina cuts about the portio in the same manner and separates the structures as in the vaginal method. After completion of the operation most operators fill out a somewhat fist-sized wound with iodoform gauze and treat it as an open wound, with the exception that the wound in the skin is partly closed, leaving an opening in the center, through which the iodoform gauze is carried out; also, in the osteoplastic resection we can not well renounce the use of this drain, and iodoform gauze is placed on each side. Steinthal brought the gauze out through the vagina, and thus closed the entire posterior wound. Zweifel, Schauta, and Wertheim have operated in similar manner with favorable results. One objection to this operation is the long convalescence, requiring fully six weeks for the patient to recover, after which time necrosis of the bone may cause fistulous openings, which may continue for a much longer period. The osteoplastic resection seems to shorten the convalescence. The complete suturing of the sacral wound, with drainage through the vagina, is the most satisfactory procedure. It can be claimed for the procedure

that the entire operation can be accomplished more readily under the eye, and ligation of the uterine arteries is accomplished separately, and not by mass ligature. Injuries of the ureters are also easy to avoid. Such injuries, however, do occur.

The operation may be found advisable in cases in which there is reason to suppose that the ureter is embedded in infiltration. In one case Schede resected a piece of the bladder

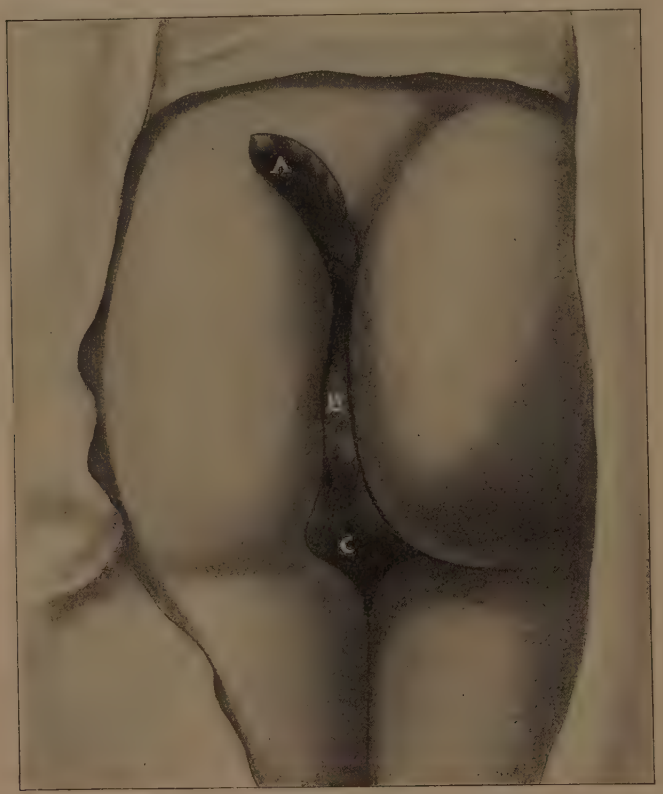


Fig. 498.—Patient from Whom Uterus, Ovaries, Posterior Wall of Vagina, Perineum, and Five Inches of the Rectum Have Been Removed.

A. Artificial anus. B. Anterior wall of vagina. C. Vulva.

three centimeters long, together with a long piece of the ureter. Von Winckel objects to the operation on the ground that he could not see the ureters. Hochenegg reported ninety-eight, with eighteen fatal cases—eight times sepsis or pelvic phlegmon. The loss of blood is much greater than in the vaginal operation. In the course of the after-treatment life may be endangered by bursting of the peritoneal wound. Hochenegg points

out that, by reason of the sacral method, a large series of cases are reported of carcinomata of the bladder; the ureter and parametrium have become more or less involved and increased the technical difficulties that complicate the operation. I have removed the uterus, ovaries, and tubes by sacral resection in one case without injuring the rectum, and in two cases with resection of the rectum. All these cases recovered. In one of the latter the operation consisted in the removal of five inches of the rectum, the uterus, ovaries, and tubes, the posterior wall of the vagina, and the perineum. The rectum was stitched to the skin over the sacrum and to the anterior wall of the vagina. This operation was performed for epithelioma involving the rectum, extending to the perineal margin around the anus and in the parametrial tissue behind the uterus. The patient had previously undergone a Maydl colostomy. After the recovery of the posterior wound an incision was made around the artificial anus and the two ends of the bowel were raised and reunited, after which all fecal discharges took place through the sacral anus. Thirteen months after the operation the patient returned to her home in Ireland, since which time no knowledge has been obtained of her progress.

581. The Perineal Method.—Zuckerkandl, in the year 1889, presented a method for extirpation of the uterus by an opening between the vagina and rectum. With the patient in the lithotomy position, the intestine was raised toward the sacrum with a /‾‾\ -shaped flap incision, whose nearly seven centimeters long transverse portion lies in the half oval line in front of the rectum, and whose angles upon each side extend to the ischial tuberosities. After separation of the skin and superficial fascia, and separation of the skin flaps from the under layer, the projecting bundle of the external sphincter, which penetrates the labial commissure, is separated and the lower part of the vagina loosened from the rectum. The remaining part of the septum is bluntly dissected until Douglas' fold is reached, when the vagina is opened transversely, the uterus drawn out from behind, and its extirpation occurs as readily as in the sacral method. The peritoneum is closed, and, after removal of the uterus, the ligament stumps can be buried in the peritoneal cavity or placed by sutures extraperitoneally, as in the vaginal method. Frommel seems to be the only one who has found this operation practicable. He holds it advantageous to cut about the vagina, as in the vaginal method, push back the bladder, pack the vagina with iodoform gauze, and then perform the perineal operation. The operation is quite bloody, as the numerous venous plexuses between the vagina and rectum are opened. The operation seems an unnecessary interference with the

pelvic floor, as the same increased room will be secured by enlarging the vagina and the danger from infection must necessarily be very greatly increased.

582. The Mortality of Abdominal and Vaginal Operations.—The mortality of operations has been greatly decreased with the improved operative methods and more careful technic. Pryor cites ninety-eight abdominal hysterectomies for cancer associated with removal of the lymphatic glands, with a mortality of 11.2 per cent. The advance in the results of vaginal work is shown by comparison of the operations of Czerny, which, in 1882, showed 32 per cent. mortality, with Wisselinck's collection in 1897, of seven hundred cases with a mortality of 8 per cent. Under especial operations the success to which the work can be carried is evidenced by the reports of Olshausen and Fehling, the former of whom had but one death in a hundred cases, and the latter two. The successes of the operator will depend somewhat upon the class of cases in which he operates. If he is inclined to operate in desperate cases, the mortality will necessarily be increased. The number of cases coming under observation early, and favorable for operation, are quite small. This is evidenced in the Berlin clinic: with 402 carcinoma cases, only 83 were favorable for operation.

583. Duration of Recovery.—In the earlier operative work, it was considered that if a patient survived the operation two or three years without recurrence, she might be pronounced cured, but further experience has demonstrated that recurrence may take place up to the fifth year. After this lapse of time the probability of permanent recovery is very great. There are occasional cases in which recurrence after partial operation has been discovered as late as six, seven, or eight years. It would be a question in these cases, however, whether it might not be considered a condition similar to that which would take place in a woman whose susceptibility to malignant degeneration was great, and that the irritation produced in scar tissue would favor such development and should be considered a primary, rather than a secondary, condition. Frommel, in his investigations, has never seen recurrence follow after four years. In one hundred and eighty-eight cases of cancer of the neck and twenty-six cases of cancer of the body reported by Fritsch he saw sixty-five free of recurrence at the end of one year, or 58.5 per cent. of the cases in the neck and 69.2 per cent. of those in the body. At the end of two years Olshausen saw one hundred and forty-one, or 44.7 per cent., of the neck, and sixteen, or 81.2 per cent., of the body free from recurrence; at the end of three years he reported one hundred and twelve, or 37.5 per cent., of the neck, and thirteen, or 69.2 per cent., of the body.

At the end of four years he found free from recurrence of cancer of the neck eighty-eight, or 29.5 per cent.; of the body, eleven, or 63.6 per cent. From this collection it is rendered evident that in the first and second years after operation the great majority of recurrences appear, and then more and more the number falls off. The duration of life following an operation largely depends upon the stage of advancement of the disease. Leopold is quoted by Williams as having recorded a recurrence of 23.7 per cent. in early cases as contrasted with 66 per cent. in a more advanced stage.

The final results of individual operators, however, are so very different that it is impossible in general to draw valuable conclusions from them. Thus, Kaltenbach, with his brilliant primary operative results, evidently extends the indications for the operation quite far, and subjects all cases to it in which it seems technically possible. It is quite readily understood that in such a number of cases there must be a few in whom the new formation has advanced proportionately far, and that relapse is not surprising. Leopold, on the other hand, drew the indications very narrowly. The investigation of statistics demonstrates that the vaginal operation has given excellent primary results, but, on the other hand, it shows that, of all the radical operations to which patients are submitted, after a year in one-half recurrence has followed, and that it recurs in the second year in a still considerable percentage. The gravity of the disease can be still further appreciated when we realize that only a small percentage of the cases which come under the observation of the gynecologist are in a condition to permit of radical operation.

584. Recurrence.—Those cases subjected to radical operation when the parametrium is without doubt extensively infiltrated are not only immediately followed by recurrence of cancer, but a fatal termination is also very rapid. Tannen has proved that the duration of life in such recurrence of the disease is briefer than it would have been had the disease been let alone, for duration of life of eight and nine months for patients in whom the disease thus recurs is less than would be secured by such palliative treatment as partial resection or energetic cauterization of the diseased area. Sanger and Thorn have shown that by the latter the duration of life is lengthened. Surgeons, from their experience in mammary cancer, are inclined to combat these views, but statistics do not support them. As contraindications, then, against total extirpation are to be considered great enlargement of the uterus and extensive adhesions, especially with intestine. Those uteri should be excluded from vaginal operation which can not be removed

through the vagina without morcellation. To this class belong those carcinoma which are complicated with myomata. Pregnant and puerperal uteri are proportionately easy to remove by the vagina, in spite of their enlargement, as has been demonstrated by Olshausen, Hofmeier, and others, and the comparative narrowing of the vagina observed in the nullipara and in old women exhibits no contraindications to the vaginal operation.

The primary operations are so satisfactory that we could scarcely wish them otherwise. Olshausen's one hundred total extirpations with but one death, when some of the patients were already pyemic, are positively brilliant results. Winter describes three forms of recurrence: (1) Local or recurrence in the wound—a return of the cancer of its primary kind in the compass of the field of operation; (2) lymph-gland recurrence, and return of the tumor in any lymph-gland of the body; (3) metastatic recurrence. Dissemination by the blood-vessels leads to the development of the tumor in the more internal organs. The first is produced either by portions of carcinomatous growth which have been overlooked in the operation or fragments that have been broken off and found lodgment in the folds of the wound. These correspond more or less to the neighborhood of the previous operation, which demonstrates the correctness of Thiersch's view, confirmed by Heidenhain's investigation on mammary cancer, that the carcinoma frequently extended itself far over the lateral or immediate limits in small sprigs, and that, after the removal of the new formation, the mass is seen to be separated by healthy tissue from visible sprigs or microscopic cancer nests that may be the source from which the cancer redevelops.

Our study of the progress of the disease has already illustrated the extension of carcinoma of the vaginal cervix in the vault and parametrial connective tissue. Mackenrodt and Leopold, in their anatomic investigations of extirpated parts of the parametrium, have demonstrated fine, microscopically perceptible sprigs situated in remote parts of the parametrium, and it is quite possible that such fine sprigs may be found outside of the incision as well. It is, consequently, difficult to be certain whether wound relapse occurs from sprigs of cancer growth in the parametrium or from small masses which have been broken off from the diseased tissue and been implanted upon the new wound. Most generally the patient gains in body-weight and improves in appearance after the operation, but individual cases will be found to exhibit pain in the depth of the pelvis at an early period, which radiates from the lower extremities, and frequently becomes very distressing. In

its further course there is edematous swelling of the lower extremities, not rarely venous thrombosis; in other cases, bleeding and discharge, which cause the patients to return for investigation.

The diagnosis of carcinoma recurrence is mostly fixed without difficulty if we make a combined investigation from the rectum, with the thumb in the vagina, by which the penetrated parametrium can be fixed between the finger-tips. Hemorrhage may sometimes take place in granulations which are formed about the ligatures, especially if silk has been used. When the appendages have been left, a mass may be felt in the vagina that has a soft sensation. The cause of bleeding upon an exact examination is recognized as the fimbriated end of the tube. The absence of infiltration and the impossibility of separating the small tumor masses from a polypus of the vagina contraindicate carcinoma. In doubtful cases the tissues should be examined with the microscope. Another form of recurrence is that of which Winter speaks as infection-relapse, in which portions of carcinoma are broken off, come in contact with healthy tissue, there lodge, and develop the original disease. In a single woman upon whom I operated to remove a small uterus through the vagina, the operation was attended with considerable difficulty; the fundus uteri was torn open in attempting to bring it down, and some jelly-like material escaped into the peritoneal cavity, which was thoroughly irrigated as soon as the operation was completed. Less than six months later the patient developed a mass upon the side of the pelvis corresponding to that into which this fluid material had escaped, and, upon opening the mass, material similar to that which had escaped from the uterine cavity was found, and the disease progressed and eventuated in the death of the patient.

The second form of recurrence is a lymphatic gland recurrence. The investigations of Poirier and Leopold have demonstrated that the lymphatic vessels of the middle and upper thirds of the vagina and from the cervix proceeded to the iliac glands along the course of the iliac vessels and at the sacro-iliac articulation in the angle formed by the separation of the external and internal iliac vessels. The lymphatic vessels of the uterine body proceed to the upper margin of the broad ligament and follow the spermatic artery to the vertebral column, where they open into the lower lumbar lymphatic glands, which are situated behind the peritoneum in the neighborhood of the large vessels. Fortunately, lymph infection occurs late in cancer of the uterus, so that lymphatic gland recurrence after total extirpation is a rare condition. After chloroform narcosis

the roundish, hard, immovable nodules can be recognized in the pelvis.

The third form is that of metastatic recurrence in which the disease is carried to more or less distant organs and presents nodules of a histologic structure similar to that of the primary cancer. These metastases in uterine carcinoma are rare, and exist only in advanced stages.

585. (*B*) **Inoperable.**—The great majority of the cases of carcinoma which come under the observation of the physician are comprised in the inoperable class. Extirpation of the uterus adds but little to a favorable prognosis when the disease is so extensive, and as palliative and symptomatic therapeutic measures are obligatory, this section, therefore, is an important one in the treatment. The treatment of this large division has not received the consideration given to the operable class, but its value must not be considered trifling. We have to study the means which will afford the patient temporary relief, diminish her suffering, and occasion, at times, a hope of recovery. The great variety of methods employed betokens the weakness of our efforts to oppose the ravages of the fearful disease.

The principal indication for treatment in inoperable carcinoma of the uterus is to combat such symptoms, as hemorrhage, discharge, and pain. The hemorrhage indicates that the new formation of the disease projects into the capillaries and small vessels, the walls of which are formed by the cancer cells, so that the most trifling injury or increased blood pressure results in rupture. The later suppuration results from wandering-in of saprophytes, which causes the structure to break down. The collection of blood and secretion in the vagina affords ready entrance to those germs which cause suppuration. They may invade the surface of the less well-nourished new formation. Hemorrhage and discharge are not always marked symptoms. The disease often makes great progress without these severe symptoms being present. They may exist only as a severe seropurulent discharge similar to that which occurs in senile colpitis, while the odor can be almost completely absent. In old women we frequently observe hard, scirrhous forms of cervix cancer, which show but trifling inclination to disintegrate; consequently, discharge and hemorrhage are wanting, and pain is caused by the further progress of the new formation or is exhibited as the only complaint of the patient. In such cases we employ narcotics almost exclusively.

Cases which require an aggressive treatment are those forms of portio and cervix cancer which are especially characterized

by vigorous growth of the new formation. The more rapid this growth, the more rapid is its transition, and, therefore, the earlier hemorrhage and discharge appear. A most effective method of treating such a condition is the removal of the newly formed mass. In the more gradual development of the disease it progresses deeply; its superficial parts perish slowly, often with considerable hemorrhage, loss of fluid as offensive discharge, decreased appetite, and therewith weariness. Palliative operative treatment is especially suitable for the cauliflower form of growth in the portio, unless the vaginal walls have been invaded. Results are less promising when, with existing ulceration, is associated very severe infiltration of the pelvic connective tissue surrounding the cervix. Further, when the new formation has already invaded the vagina, the knife should not be employed to do more than cut away the fungiform growth, because the wall is thin and the infiltration zone is often difficult to recognize. The knife is especially improper in the more deeply situated cancer of the cervix, for which the sharp curet should find most employment. The operation should be preceded by a careful examination under narcosis, which is often necessary to determine contraindications to total extirpation.

A palliative treatment may be employed in order to spare the patient further narcosis. In investigation we especially observe whether the new formation projects deeply into Douglas' cavity or upon the bladder. In such cases injury to organs occurs easily, although injury of the rectum rarely follows. Approach of the disease to the bladder is best investigated by the introduction of a catheter, by which the bladder is pressed against the palpating finger. The extension to Douglas' pouch is easily recognized by a digital investigation from the rectum. In large carcinomatous collections we strive to ascertain the extension of the cancer ends beyond the uterus. If the parametrium is invaded, we must prepare for severe hemorrhage, as cureting can easily injure the large branches of the uterine artery.

Cureting is the principal palliative operation for cancer, but the treatment should not be confined alone to the use of the curet. Such treatment injures previously uninvolved tissue, which becomes a favorable soil for the extension of the disease, and the subsequent progress is more rapid. Cureting should always be followed by an immediate employment of the cautery or by the application of some strong caustic agent which will destroy a large part of the infiltrated zone and reach tissue of a more normal character. The uterus is exposed by a speculum and lateral retractors. In preparation for the

employment of the cautery the operator should be prepared to protect the vagina and external genitalia with wooden retractors. To avoid too much absorption of light from the depth of the cavity by their dark color, their inner surfaces should be coated with a thin layer of quicksilver. In addition are needed sharp curets, scissors, forceps, needle-holder and needles, the latter for use in case of fistula, though they are seldom required. We should also have ice-water for irrigation, and sponges or pads or, still better, cotton or gauze pads upon long forceps. Although the use of the curet is not painful, it is advisable for the patient to be under an anesthetic, as the fear of burning would be so great that an effectual application of the hot iron could not be made.

While the patient may not ask the character of the disease, her fears cause her to anticipate the worst, and her confidence in what is being done for her will be dependent upon its apparent gravity, and the abatement of the symptoms which follows the procedure permits her to secure new courage. It is well that she should be assured that we do not expect to remove completely the discharge, and that subsequent treatment may be necessary. She is thus saved from utter despair upon the return of the discharge.

The procedure is as follows: The patient, narcotized, is placed upon an operating table and the parts are cleansed as thoroughly as the condition will permit; the new formation is exposed with retractors and as much as possible of the tissue is scraped away with a sharp curet, reaching the firm infiltration zone. In the softer parts of the cancer the hemorrhage is considerable, but becomes less as the infiltration zone is reached, because there the vessels still retain their contractile power. To limit the bleeding, then, it is important to proceed rapidly with the curet. As we proceed, the scraped masses are removed by irrigation with ice-water, or, probably equally effectively, with water at a temperature of 120° F. The irrigation enables us the better to inspect the operative field. The finger must be employed occasionally to judge of the progress and of the amount of resistance, especially of thin points, particularly in the posterior vaginal vault and over the bladder, to assure ourselves that perforation will not occur, and that the new formation has been sufficiently removed. A smaller curet can be employed to remove further tufts in the uterine cavity. Shreds and ragged masses which elude the curet are seized with forceps and cut away with scissors, and the bleeding is controlled by firm pressure with gauze pledgets. A crater-like cavity is formed, which frequently can project into the parametrial tissue, which is further cleansed, and from

which hemorrhage is arrested by the use of the thermocautery. It has been advised that the thermocautery be followed by coating the vaginal walls with vaselin, impregnating the diseased structure with alcohol and igniting it, allowing it to burn for one-half minute to a minute and a half. In the most favorable cases cicatrization is produced. With cicatrization the cavity shrinks, and is much diminished. The action of the Paquelin thermocautery must be prolonged to be most effective. It must be frequently removed, because blood and shreds of tissue rapidly coat it. The removal is also done to permit the tissues to cool, that undue scorching may not occur at undesirable points. When the hemorrhage is quite profuse, it is important to bring the entire cavity at once in contact with the cautery. After the hemorrhage is incidentally controlled, we see, here and there, blood trickling and oozing from small points, which must be resubjected to the cautery until the cavity is lined by a thick, dry eschar. Especial care must be exercised toward the vaginal margin, for bleeding will continue there the longest.

To secure a deep, dry eschar, we use irrigation with ice-water at intervals only in the early part of the treatment, and later withdraw and cool the retractors, or retain them in the vagina and cool with a pad wet with ice-water. If these precautions are omitted, the vagina becomes severely burned in prolonged operations. With the wooden retractors the danger of burning is lessened, but the long employment of the cautery will require an occasional cooling of the cavity. The procedure concluded, the cavity should be packed with iodoform gauze. Fritsch advises that the tampon be preceded by a teaspoonful of a powder containing equal parts of boric acid and tannin.

In properly selected and carefully managed cases the danger of the procedure is slight, and it can be accomplished without injury to the bladder or the peritoneum. Injuries to the latter are usually not serious. The hemorrhage may be considerable, though it is usually controlled without difficulty by the prolonged use of the cautery. A ligature is rarely required, for the cautery is competent to control even arterial bleeding. In the rare cases of inoperable cancer of the uterine body great prudence must be exercised to prevent the cautery from perforating the thin walls. The finger can generally enter the cavity, by which the weak places can be recognized and undue pressure against them avoided. The procedure is usually borne with but little discomfort. The patient will scarcely complain, unless we have unfortunately made an eschar upon the external genitalia, which is very painful and soon becomes edematous.

After the procedure is completed the vulva should be covered with vaselin, and, in the most trifling external burning, a pad should be applied, which is frequently wet with lead-water and laudanum, or a carbolic acid solution should be applied to the external genitalia. Slight elevation of temperature is generally noticed after such operations, but they exert no marked influence upon the general condition, and the temperature subsides in a few days.

Parametritis and septic processes are rarely observed. The tampon should remain five or six days. The eschar will be found to have partly separated under trifling suppuration, and the cavity will be more or less diminished. After withdrawal of the tampon the loose-lying tissues are carefully removed. The exercise of force must be avoided, because it causes hemorrhage. The cavity is sponged, and we await the complete separation of the slough. Our treatment after the removal of the eschar is directed to the securing of cicatrization. Olshausen lauds for this purpose tincture of iodin. He employs the stronger solution:

℞. Iodin. pur., ... 1 part
Rectified spirits, ... 8 parts.

It is applied by a saturated pledget of cotton, which is pressed lightly against the cervix. The superfluous portion flows back into the bowl of the speculum, from which it may be used over and over. The alcohol is an excellent antiseptic.

The patient should be advised to wear a napkin after the application to protect the clothing. The applications are made every two or three days until the cavity contracts and becomes clean. In favorable cases a watery discharge, sometimes tinged with blood, follows, which has entirely lost its offensive odor and is so slight that the patient considers herself cured. Torggler tampons the vagina with iodoform gauze saturated with peroxid of hydrogen and permits it to remain for three or four days. The surface is scraped with the sharp curet, subjected to the thermocautery, and covered for a few minutes with cotton soaked with a 40 per cent. solution of formaldehyde. Six to ten days later a slough is thrown off, which leaves a dry wound.

Caustics.—Sims followed the use of the curet by an application of zinc chlorid solution. Hemorrhage was controlled by pledgets wet with a solution of persulphate of iron, which were removed and followed by tampons wet with the zinc solution. Van de Warker used a 50 per cent. solution of the chlorid of zinc. After the use of the curet small pledgets, squeezed from a 50 per cent. solution of zinc chlorid, are placed against the

diseased surfaces. The healthy tissues are previously protected from injury by an ointment of bicarbonate of soda in vaselin. These medicated pledgets are so placed as to come in contact with the entire diseased surface; over them a piece of dry absorbent cotton or gauze is laid, after which the vagina is filled with a wad of cotton wet with a saturated solution of bicarbonate of soda.

The carbonate causes a decomposition of the zinc salt, which renders it nonirritating to the tissues. The nurse can press the superfluous agent out of the pledgets without injury to her fingers by first anointing them with vaselin. Without the precaution above directed, the vagina, and especially the introitus, would be badly burned; indeed, in spite of every precaution the vagina is frequently seriously injured. Where the wall is thin, as over the bladder, the weaker solution (℥vj to f℥j) employed by Sims should be substituted. Sims left the tampons undisturbed for four or five days, unless earlier removal was indicated by elevation of temperature. He ascribed to the agent no especial influence upon the cancer beyond its active destructive effect, but Van de Warker believes the drug to have a special affinity for the cancer tissue, selecting it and leaving the healthy tissue. The microscopic investigations of Ehler upon this subject, however, demonstrate the contrary—that the cancerous tissue is only superficially affected, while necrosis of the healthy tissue extends to a considerable depth. Fränkel employs the zinc salt, but previously scorches the surface with the thermocautery. He leaves the pledgets in contact with the affected surface for twenty-four hours. Great care must be exercised in the cases for which this treatment is employed. Should the bladder or posterior vaginal wall be infiltrated, or if these parts are insufficiently protected, fistulæ may form, which greatly aggravate the subsequent condition of the patient. A slough resulting from the application may open the bladder, rectum, or peritoneal cavity. During or following the separation of the slough, a hemorrhage so severe as to cause a fatal result may readily occur. When the slough has separated exuberant granulations develop, and later strong cicatricial contraction and shrinking, which Fritsch indicated as the cause of extraordinarily severe pain, which is aggravated by the increased infiltration above the scar tissue.

Ricard relates the history of a patient in whom hematometra and hematosalpinx followed the introduction of zinc chlorid pencils into the uterus. The scar tissue was so dense that the collection could not be reached per vaginam, and the woman perished from hemorrhage after laparotomy. The cervix and the greater part of the uterus had degenerated in cancer. Many patients in whom this treatment has been employed have been

so much improved as fully to justify its practice in similar cases, but strong solutions and the paste should be absolutely interdicted.

Fraipont advocates the use of liquor ferri sesqui chloridi, from which he obtained excellent results. This agent has a superficial action upon the surfaces to which it is applied, and forms a slough, following the discharge of which hemorrhage is likely to recur. The bleeding following the curetment can only be incompletely controlled by pressure with an iron solution. A better application is a tampon of iron chlorid. Cotton is saturated with this substance and packed against the surface. These pledgets of cotton form hard lumps, which are difficult to move, and are only slowly separated under strong suppuration or discharge. An early attempt at their removal is attended with severe pain and hemorrhage.

Leopold advocates the use of a concentrated carbolic acid treatment which he continues from one to two months. After radical scraping and scorching with Paquelin's cautery, he supplemented this with quarterly scraping and the use of the cautery by plunging it into the new growths so that the tissue is rapidly scorched. Chrobak used, after cureting, repeated cauterization with nitric acid. Out of sixty-five cases so treated, he attained good duration results. In one of these cases, after radical sloughing of the carcinoma of the cervix three years and nine months later, because of the strong scar tissue, there had formed a hematometra, which was emptied twice. In other cases after repeated cureting and cauterization, strong scar formation was seen at the end of three years without recurrence. The third patient still lived five years after operation, free from recurrence.

M. Guinard, in 1896, and Etheridge, in 1898, advocated the employment of calcium carbide. In the treatment of inoperable uterine cancer a piece of calcium carbide the size of a small nut is introduced into the vagina, and iodoform gauze is quickly packed about it. It forms acetylene. Three days later the dressings are removed and the vagina well washed, the remains of the calcium oxid are brought away, the parts are dried, and a new application is made. The vegetations rapidly disappear, and there remains only a smooth gray surface, free from moisture. Etheridge claimed that after a few treatments the edges of the cavity began to draw in, and the area of the crater was diminished. Its entire appearance impressed one with the idea that it had taken on an entirely healthy character. The cavity contracts until it is entirely obliterated, and puckers the vault of the vagina. This treatment does not seem to have stood the test of time, and is now scarcely considered. Goodell advocated in inoperable cancer the use of applications of powdered pepsin

and salicylic acid—pepsin to digest and eat off the diseased tissues, salicylic acid to prevent decomposition. Cucca and Ungara advocate tampons wet with:

℞. Methyl-blue,.....gr. xc
Alcohol (95 per cent.),
Glycerin,.....aa f℥iij
Water,.....f℥vij. M.
Apply to the diseased surface.

It arrests hemorrhage, aborts discharge, and prolongs life.

Parenchymatous Injections.—Various agents have been employed as injections into the structure of the cancer with a view to moderating its course or destroying it. Thiersch used nitrate of silver; Schramm, chlorid of sodium and sublimate. Mosetig-Moorhof and Stilling employed pyoktanin. Schultze has lately used injections of absolute alcohol in a large series of cases. Bernhardt employed a 6 per cent. solution of salicylic acid in 60 per cent. alcohol. Vulliet, independently of Schultze, has practised the treatment with absolute alcohol. Under this treatment the bleeding and discharge were trifling or ceased entirely. After ten or fifteen injections the evil smell of the discharge disappeared and the pain ceased. Treatment, in the beginning, should occur at intervals of a few days. During the intervals the vagina may be tamponed with iodoform gauze. In the course of weeks or months the ulcer heals and the infiltrate disappears. Schultze suggests that when the injection is in the neighborhood of the peritoneum, the after-treatment is painful. Schramm found the injections painful and without special influence. The treatment has to be continued over weeks and months—a requirement that we are able to carry out only in rare cases. Without question, better results will be obtained by the use of the curet and the thermocautery.

A. Martin, in inoperable cases, advocates suturing the wound surface occasioned by the curetment. The carcinomatous masses are removed with the sharp spoon and the parametrium is ligated; then, drawing down the uterine stump, strong curved needles are passed under the entire wound surface to the border of the neck or to the mucous membrane, and the thread is so secured that it brings together the wound surfaces created by the curetment. In a very extensive wound the entire pelvic body is protected by a mattress suture, when the mobility of the stump is so limited that it is impossible to accomplish the partial sewing of the wound surface. The vagina is so sutured in the depth of the crater that a continuous series of firm sutures come to lie about the opening. The operation, however, is impracticable, because frequently we have to clean out extensive cavities with strong infiltrated walls. The advantages offered by the method are that hemorrhage is

securely controlled and that after-hemorrhages do not appear. The patient is spared the suppuration which follows the caustic, and it forms a firm scar. Houzel and Chrobak have seen good results from suturing. The method, however, is applicable only to a limited number of cases, and frequently offers great technical difficulties. Sutures will often cut through the carcinomatous tissue; sometimes the wound surfaces break apart, and suppuration again follows. The reported good results are less from the suture of the wound surface than from the union with the parametrium.

A class of cases will be found in which the disease is such that no palliative operation will afford relief. We must still endeavor to make the patient comfortable and to relieve the distressing symptoms. These are hemorrhage and profuse offensive discharge. The latter becomes so disgusting as to be distressing to the patient and to those about her. Local treatment is demanded. Syringing and tamponade with wet or dry dressings come under consideration. The control of hemorrhage is accomplished more effectually by the tamponade than by syringing with astringents. Kehrer employed the tampon with cotton gauze saturated in an 8 to 10 per cent. solution of acetic alum. Iodoform gauze also exercises a good influence upon the smell of the discharge, but through a long employment the odor of the iodoform becomes persistent and annoying.

The dry treatment, introduced by Sänger and employed by Fritsch, often proves beneficial, though it requires medicinal help in order to carry it out. It may be employed alternately with injections. The dry treatment follows curetment and cauterization. Iodoform is blown into the vagina, which is then firmly tamponed with iodoform gauze. Tamponades covered with iodoform may be introduced, and may remain as long as possible. This treatment should be repeated once or twice a week for some time. It controls hemorrhage, but especially keeps down the unpleasant smell of the discharge. The unpleasant odor of the iodoform and the existing danger of intoxication have led to the substitution of tannin and boric acid and salicylic acid for similar purposes. Torggler employed charcoal powder with iodoform, which deodorized the mixture; the ulcerated surfaces were rapidly cleaned. Long-continued sitz-baths often have a beneficial influence and afford the patient great relief. When penetration of the bladder occurs, the patient may keep herself comparatively comfortable by wearing a urinal.

It is important that the patient should be kept out of bed as long as her strength will permit. When once she becomes bedridden, her condition is made worse, and the psychic depression is more marked. It requires the greatest cleanliness and most

continuous care upon the part of the nurse to limit the occurrence of bed-sores, as the continuous and abundant discharge keeps the parts wet, and in emaciated persons with feeble powers of resistance the skin becomes broken and extensive bed-sores follow. In these enfeebled patients it is not to be expected that the loss of substance will be recovered, and scarcely that the wound surface can be kept clean. By the processes of absorption from the wound surface, and the breaking-down cancer, the patient soon has regular elevation of temperature, which aggravates the discharge. It is not worth while giving antipyretics for the elevation of temperature in these cases, as they have but trifling influence, and soon break down nutritive processes. A mixture of salol and aristol has been employed with advantage. When the patient is unable to be continuously under medical treatment, resort must be had to irrigation. The entire series of antiseptic means have been employed; injections of permanganate of potash, one to two teaspoonfuls of 5 per cent. solution in a gallon of water, is one of the best. The drug is cheap, and possesses the advantage that the patient is using a substance that does not irritate or burn, is completely odorless, and is an excellent disinfecting fluid. It has the advantage over the phenols that the peculiar smell of the latter, mixed with cancer discharge, soon annoys the patient. Martin recommended for a deodorizing injection a solution of 3 per cent. hydrogen peroxid with 1 per cent. thymol. Various astringent fluids, as pyroligneous acid and alum solution, are favored.

If penetration of the bladder and rectum has already resulted, the condition of the patient is comfortless. We may use tampons saturated with fatty or oily mixtures, such as bismuth salve or carbolized oil. The discharge is thus sometimes held back, but the continued irritation of the parts results in an excoriation eczema of the external genitalia, which is a new source of torment for the unfortunate patient. In such cases the removal of the disagreeable odor is no longer possible. In patients suffering from edematous external genitalia covered with excoriations and ulcers, and from already existing edema in the lower extremities, irrigation is very difficult, and is practicable only under increase of pain. Covering the lower extremities with a rubber skirt, by which the odor is prevented from rising, has been advocated, but the moist warmth thus engendered soon renders it unbearable. Fritsch advocates completely covering the vulva and the inner surface of the thighs with frequently changed pads wet with chlorin water, thus to obscure as much as possible the offensive odor.

When the disease is far advanced, neither the greatest cleanliness nor the admission of fresh air to the sick-room is sufficient

to drive out this odor, and the patient becomes a source of discomfort to herself and to those who attend her. Anorexia makes itself noticeable early. This is undoubtedly due to the influence of the sickening odor upon the appetite. Every form of food becomes absolutely repugnant, and we are obliged to confine ourselves then to the smallest quantities of liquid nourishment. Sometimes these are more readily taken when cold. Patients frequently live for a remarkable length of time with scarcely any nourishment. The relief occasioned by the removal of the odor usually results in the improvement of the appetite. Obstinate constipation becomes a marked symptom, which also acts unfavorably on the appetite. When evacuation occurs, it is so extraordinarily painful, because of the hard infiltration in the pelvis, that the patients are constrained to avoid defecation in order to escape the pain. Large enemata are better than purgatives in such cases. Of course, if a rectal fistula exists, they can not be employed. The uncontrollable vomiting which marks the advent of a uremic condition is an exceedingly distressing symptom. Occasionally, the administration of diuretics will relieve it. The condition of the urinary secretion should be observed; any failure should be an indication to administer diuretics, by which the appearance of vomiting can be obviated.

In the later stages the third distressing symptom is pain, which can be avoided only by the free use of narcotics. The only hesitation in the administration of narcotics should be to avoid their too lavish use early. The patient who becomes accustomed to large doses of the narcotics, when she reaches a stage at which they are still more seriously needed will have become so inured to the drug that it is no longer useful. Early in the disease it is better to employ other agents as substitutes. Antipyrin has been found effective. In extensive infiltration involving the lateral and posterior parts of the pelvis this remedy is useless. Such cases are relieved by rectal suppositories containing:

℞. Morphin sulph., ... gr. ½
Pulv. opii pur., ... gr. ¼
Pulv. belladon., ... gr. ⅓
Ol. theobrom., ... ʒij.
Ft. supposit.

Such a suppository, given at night, relieves the distress, secures sleep, and enables us to avoid the larger doses of morphin. An additional advantage is that by such a combination we can increase the dose and give the patient the prescribed daily ration which she can use. Codein may be given in pill form. In the later stages of the disease only the subcutaneous employment of large doses of morphin will afford relief. Fortunately for the patient and her relatives, toward the end of the disease the com-

pression and obstruction of the ureters occasionally cause sufficient uremia to obtund the general sensibility and lessen the discomfort. The soporose and comatose conditions are frequent, and increase the comfort of the patient. Cumston's proposition to relieve the obstruction by establishing a ureteral fistula or performing a nephrotomy should receive no consideration. In advanced stages Drszewczky claims benefit from an ointment of extract of condurango and vaselin.

586. Pregnancy Complicating Carcinoma.—We have already spoken of the occurrence of pregnancy as a complication of carcinoma—a complication which is fraught with the greatest danger to two lives. It was stated that the treatment would entirely depend upon the progress of the disease. Thus, if the disease was inoperable, and there was no possible chance for the mother, every effort should be made to prolong the pregnancy to full term or to viability of the child, in order that it should have a chance for its life; when, however, the disease is operable and there is hope for a radical cure of the patient, no consideration for the child should operate against the mother's chances. The continuation of the pregnancy is doubtful, and it is attended with improbability of the child being delivered alive. Danger to the mother is very greatly increased, with almost the certainty that the progress of the disease will be so rapid that at the termination of pregnancy the time for radical treatment will be found to be past. Under such circumstances the proper consideration is the life of the mother. If the pregnancy has not reached the fourth month, we may proceed to the removal of the uterus per vaginam. Emptying the uterus reduces its size and renders easier its subsequent removal through the vagina. In the fourth month the operation should be performed through the abdomen. Between the fifth and seventh months we may be governed by the condition as to whether we wait for viability or proceed to immediate operation. If the disease is apparently progressing rapidly, an operation should be done immediately, without regard to the child. We may resort to an abortion, and then operate through the vagina, or the abdomen may be opened. In advanced pregnancy Martin has advocated the supravaginal amputation of the uterus and the extirpation of the carcinomatous cervix by the vagina. The advantages of this procedure are that the abdomen is kept open but a short time, that the hemorrhage can be better controlled from below, and that the carcinomatous masses are not drawn back through the abdominal cavity. Of six patients thus operated upon, one died of septic peritonitis. In the last two months of pregnancy we have to consider the treatment which has in view the preservation of two lives. Cesarean section should be performed, which is followed by a Freund abdominal,

the Zweifel combined, or, finally, the pure vaginal total extirpation. Of these procedures, the abdominal operation seems preferable.

We come next to the consideration of operable carcinoma in labor. Here we have the possibility of a spontaneous ending of labor through the diseased passages. This may be considered, if the disease is still in the early stages. If the carcinomatous infiltration has not involved the entire portio, and a more or less large zone of the uterine margin remains free and capable of dilating, the ovum may be thus extruded. When the carcinomatous masses can not be crushed by the head, they should be cut away with scissors or the thermocautery as a preliminary, and the child should be delivered by forceps or by version. If the ovum is dead, its size may be diminished by perforation or by piecemeal operation, whichever will end the labor most effectively and in the best manner for the mother. Following the delivery, we may consider immediate vaginal total extirpation, or its delay until the second week of the puerperium. The delay in these cases is suggested because of the size of the uterus. The advantages of the procedure, however, are that the uterus permits itself to be readily drawn down to the vulva, and that the wall of the vulva and the vagina have been so distended by the passage of the fetus that they do not afford an artificial hindrance. Occasionally, the size of the uterus affords difficulty. It can then be reduced by splitting it into two parts in the median line, but this endangers the reinfection of the wound.

587. Summary.—In the discussion of the subject of cancer I have endeavored to give a comprehensive view of the methods by which the disease can be combated. As such a statement must be, however, more or less confusing to the student, it is my purpose in this section to briefly present the indications for special treatment. The two principal methods of treating operable cancer are by the abdominal and vaginal routes. The sacral method affords no advantages which render it worthy of consideration. When the uterus is large and the disease has evidently extended to, if not into, the parametrium and is complicated with myoma, ovarian tumor, or the later stages of pregnancy, or when the vagina is undilated and narrow, abdominal hysterectomy should be preferred. Vaginal hysterectomy when carcinoma is limited to a uterus freely movable, not too large and accessible through a roomy vagina, has been the operation of election. The after-results, however, have demonstrated that vaginal hysterectomy, as ordinarily performed, is ineffective in that it does not afford opportunity for the removal of sufficient tissue to insure against early recurrence. The operator should keep two objects in mind in proceeding to per-

form any operation for carcinoma: (1) To insure the removal of a diseased organ in a healthy field, which is accomplished where possible by the removal of the upper part of the vagina and as much parametrial tissue as safety for the ureters and bladder will permit, thus getting beyond the isolated nests, which may be situated in the parametrium; (2) the exercise of such precautions as will avoid the implantation of cancerous material upon the healthy wound.

In the vaginal operation we have the choice of three methods of procedure for the control of hemorrhage. These are the employment of pressure forceps or clamps, the electric cautery, and the ligature. The clamp procedure has the advantage of being more expeditious, enabling us to remove the uterus in favorable cases in a very few minutes. It has the disadvantage that it produces an increased amount of pain, from the weight and dragging of the clamps and the necessity of the patient being confined to the dorsal position. The retention of the clamps produces a certain amount of necrotic tissue in the peritoneal cavity after removal of the clamp, and causes increased danger of septic infection. The removal of the clamps, often as late as forty-eight hours, is sometimes attended with quite free after-bleeding, which may require their reapplication, under very great disadvantage, in order to save the life of the patient. In a large hospital where there is a convenient electric light plant or connection with the street current can be made, the electrocautery is ideal, otherwise it means the employment of special apparatus, which is cumbersome and requires expert skill to manage and maintain in order. The ligature method is slower, but the hemostasis is more sure and the comfort of the patient is enhanced during convalescence. Catgut is preferable to silk for the ligature, because the latter ligature is likely to become infected, after which the silk will cause a sinus and a discharge, which continues until the ligature is removed, and causes worry and distress to the patient, inducing her to believe that the disease is returning.

In an abdominal hysterectomy the method suggested in Section 578 is the proper course. The uterine arteries should be ligated separately near their origin, the course of the ureters observed, and an extensive removal of the parametrium and upper part of the vagina made. This procedure, in my judgment, is more important than the removal of glands. Before closing the wound, bleeding vessels are carefully secured. When there is much oozing or a large surface has been denuded of peritoneum, gauze is carried through the opening into the vagina, packed into the cellular tissue upon each side, and the peritoneum united over it by a continuous catgut suture. The abdominal

cavity is cleansed; the wound is closed as in ordinary abdominal procedures. The gauze packing in these cases may be left in for from six to eight days and then removed through the vagina.

588. Chorio-epithelioma Malignum.—Some fifteen years ago a condition was recognized as a form of malignant disease which is intimately associated with pregnancy. It has been described under the various names of deciduoma malignum, deciduomatous sarcoma, sarcoma deciduo cellulare, blastoma, deciduo chorion cellulare, syncytium carcinoma, syncytio malignum, the destructive bladder mole, destructive placental polyp, and the title of our section, chorio-epithelioma malignum. These various designations indicate the attempts upon the part of the different

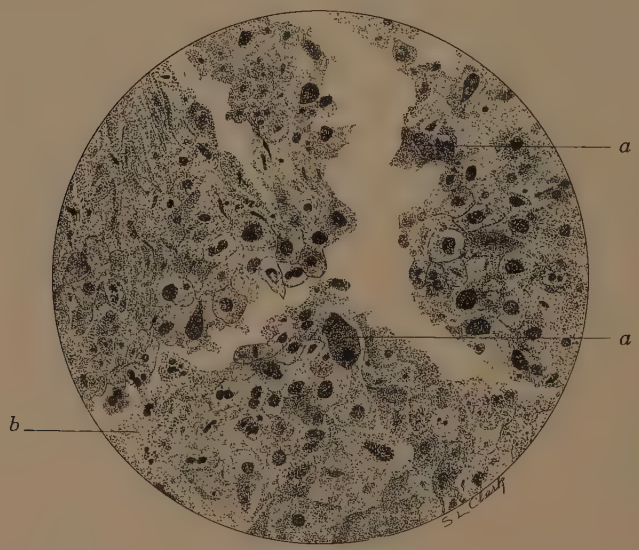


Fig. 499.—Chorio-epithelioma Malignum. (Section furnished by Drs. C. P. Noble and S. E. Tracy.)
a, a. Large syncytial cells. *b,* Blood detritus.

investigators to name the structural origin of the condition. (Fig. 499.) It was formerly supposed to be due to the degenerative changes resulting from a cyst mole, from which metastases were carried by the veins to different points, and growths of the similar epithelial structure followed. Later investigations, however, have disclosed that the mole is not necessary to its development, although favoring its growth. Later investigators agree with Marchand that it arises from the syncytial cells, although there is still want of agreement as to whether these cells are fetal or maternal.

Etiology.—The disease occurs during the period of active reproductive life and follows an abortion, either intrauterine or tubal, a normal labor, and frequently a hydatid mole. It has been attributed to want of nourishment in the villi. The condition has occurred during pregnancy, as Pick reports a case in which a tumor was situated in the posterior wall of the vagina, which, upon removal, contained distended chorionic villi with proliferated syncytial cells.

Symptoms.—In a few days to a few months following the termination of a pregnancy a patient suffers from repeated bleeding, increasing in severity, the patient becoming markedly anemic. There will also be a profuse dirty watery discharge. The continued drain, the hemorrhage and discharge, give rise to extreme weakness and a cachectic appearance. Curetment of the uterus in a condition like this results in the removal of a varying quantity of soft, friable material, which looks like placenta and bleeds freely. Oftentimes it will contain necrotic tissue, causing an extremely offensive odor. Very frequently a metastasis in the form of small round masses will be observed on the anterior wall of the vagina, which, on being opened, will present tissue similar to that removed from the uterus. Similar metastases result in the formation of growths in other portions of the body. Thus we may find it carried to the lungs, pleura, diaphragm, spleen, pericardium, kidney, liver, intestines, and even the brain. When the diseased tissue is cureted from the uterus, the patient has but temporary relief; hemorrhages again return, and a second curetment will remove tissue similar to that which was found in the first employment of this instrument.

Diagnosis.—Diagnosis is easy in the advanced cases, but difficult in early stages. It is determined both by clinical observation and microscopic investigation. The rapid return of hemorrhage after the curetment in which no fetal products are found, the foul discharges, the profound anemia, elevation of temperature, large uterus, dilated os, soft friable tumor, and the metastasis, with the revelations of the microscope, should render the diagnosis positive. The disease so closely resembles both carcinoma and sarcoma as to render it difficult to differentiate between them. Its structure having no stroma and being disseminated by the blood-vessels rather than by the lymphatics makes it closely akin to sarcoma. From sarcoma, however, it is differentiated by the fact that it is composed largely of epithelial elements.

Prognosis.—The prognosis is extremely grave. The only hope will be in its early recognition and the prompt extirpation of the uterus. Marchand reports twenty-eight cases with twenty-four deaths. It is one of the most malignant of growths, and generally recurs in six months, whether operation is done or not.

Veit reported recovery after metastases had occurred, but this is contrary to the general experience. In the extirpation of the disease the abdominal operation is preferable, for the reason that there is less danger of fragments of the tissue being forced into the veins.

589. Endothelioma Uteri.—A recently recognized form of malignant disease which occurs in various tissues of the body is known as endothelioma, and has its origin in the endothelial lining of the blood- and lymph-vessels and the serous membranes. These growths manifest themselves in many ways, according to the structures involved and the particular endothelium from

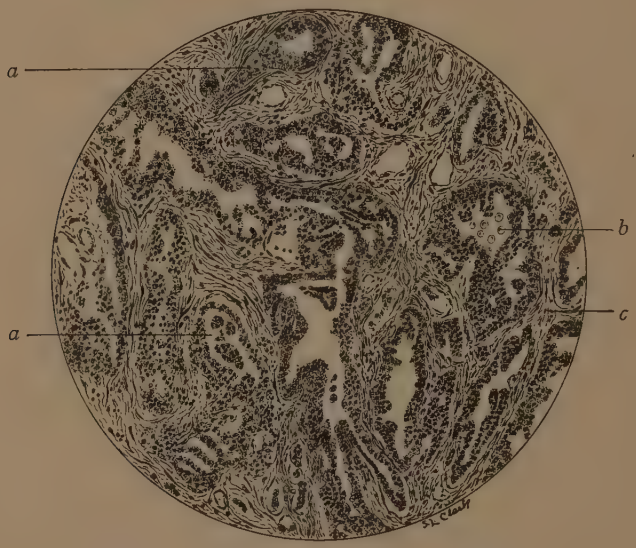


Fig. 500.—Endothelioma of the Uterus.
a, *a*. Endothelial cells infiltrating lymph-spaces. *b*. Blood-cells. *c*. Connective-tissue matrix.

which they have originated. The disease may occur in the cervix, although extremely rare, and is very similar to that of the squamous-cell carcinoma, and the diagnosis can only be determined by the employment of the microscope. The examination of the section of tissue reveals the squamous epithelium intact, free from any infolding process projecting into the underlying tissue. The growth consists of spaces lined by one or more layers of cells, resembling lymph-spaces. Where these spaces are obliterated by masses of proliferative cells, there is a resemblance to the squamous nests, but in the latter the outer layer assumes a cuboidal or more cylindrical form and the nuclei are more

vesicular. (Fig. 500.) When the disease involves the body of the uterus, it is likely to form a tumor of considerable size, and in its course and progress will resemble sarcoma. Metastases usually occur through the blood-vessels. In my own experience, I have noted that it is very prone to extend upon the peritoneal surface and result in the formation of numerous nodules over the peritoneum, and even eventuate in intestinal obstruction. Unless the latter symptoms occur, the disease is singularly free from pain, the patient complaining rather of the progressive emaciation and the continuous loss of strength. The prognosis is very unfavorable, since the disease progresses by both the lymph- and blood-vessels, but more frequently by the latter.

590. Sarcoma Uteri.—Sarcoma of the uterus can involve either the mucous membrane or the wall of the organ, and hence is divided into two groups. Clinically it is found either in the body or in the cervix, more frequently in the former, and this holds true in both its anatomic varieties. Sarcoma of the mucous membrane is one and one-half times more frequent than the same infection of the wall. It differs from carcinoma in that it is a growth which springs from the connective-tissue cells, the latter from the epithelial.

591. Varieties.—Sarcoma is divided into sarcoma of the cervix and sarcoma of the body. Sarcoma of the cervix occurs generally as grape-like clusters, protruding from the cervical mucous membrane, and it is also called sarcoma colli uteri hydropicum papillæ, and, from its grape-like appearance, sarcoma botryoides. From their soft appearance, they have been described as myxomatous, but Pfannenstiel says this condition is due to a form of lymph edema. In the body of the uterus the disease may occupy the mucous membrane or the mural structure of the organ, and be either diffuse or circumscribed. Sarcoma of the uterine wall arises in either the mural portion of the uterus or from degeneration of a fibromyoma. The latter origin is regarded as the more frequent. It is often very difficult to make certain whether the disease has originated as a primary sarcoma of the wall or from a myoma. When it is recognized as situated in a myoma or surrounded by myomatous tissue, the latter is evidently its source. Where the myoma is associated with a sarcoma which involves the adjoining tissue as well, the origin may remain doubtful. Sarcoma of the mucous membrane overlying a fibroma is not infrequently observed.

592. Pathology.—Sarcoma involving the mucous membrane occurs in the diffuse and polypoid forms. The former does not necessarily involve the entire surface, like a fungous endometritis, but appears as a more or less circumscribed growth, from the surface of which there are irregular projections, giving the new forma-

tion a roughened, often villous appearance. The polypoid variety is nearly three times as frequent, both in the body and in the cervix. Sarcoma of the mucous membrane is twice as frequent in the body as in the cervix. The grape-like clusters, already mentioned, protrude from the external os by the pedicle. The extremities of these are soft, oftentimes easily broken down, and they form a dense cluster, projecting from the os, in which the different portions of it are molded or flattened by pressure. They arise by a firm, more or less broad pedicle from the mucous membrane of the cervical canal and project from the external os into the vagina, showing a great resemblance to the bladder

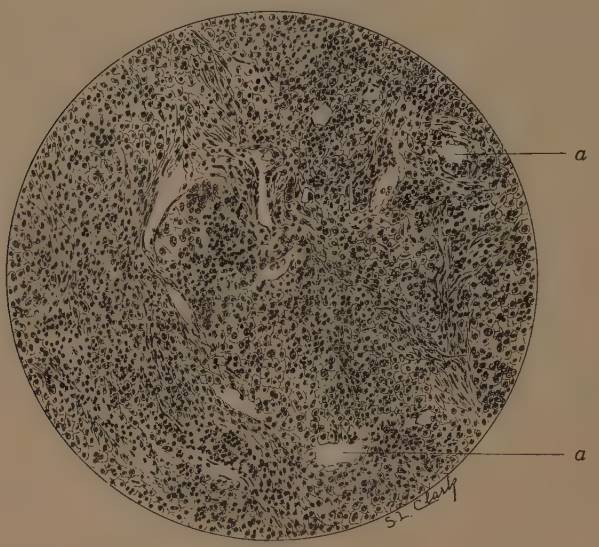


Fig. 501.—Sarcoma of the Body of the Uterus.
a, *a*. Characteristic appearance of blood-vessels minus distinct wall, the wall being formed by the malignant cells.

mole. While the foundation part of the new formation of the cervical canal consists of firm, fibrous tissue, the vaginal portion is strongly edematous, soft, almost fluctuating, and easily broken down. The growth has a pedicle which is often thinned and drawn out, made up of a number of individual berries which are situated so close together that they are flattened. (Fig. 501.) These vary in size from a grain of corn to that of a grape, and their stalk shows a smooth, moist, glistening surface of a yellowish-white, brownish, or blue-black color, alterations which are produced by the entrance of blood into the tissues. The berries are most often bluish in color, and in some places vitreous

changes are seen. The berry contains a bright or light yellow fluid and collapses upon its escape. These projections, however, usually have about the appearance, if not the consistency, of a mucous polypus. The growth takes its origin from the superior layer of the mucous membrane and assumes the grape-like form only after its extrusion into the vagina. This form is produced by interference with the circulation from pressure upon the pedicle, which, as a rule, causes edema and swelling of the intravaginal portion. The disease progresses slowly, but is often carried and disseminated by the blood-vessels. The individual cells are mostly of the roundish or spindle form. Between them is almost uniformly found a very fine intercellular substance. Parts of the new formation are divided by fissures or ramifying spaces, which, from the high cylindric epithelium and the nuclei situated in the cells, are recognized as the cervical glands. These glands are not sufficiently numerous to justify the appellation of adenosarcoma, a term sometimes applied to the condition. The diffuse form affects the body. Its progress is slow and it extends upon the surface, showing great reluctance to the invasion of the subjacent wall. As it follows the surface, it is manifested by large or small nodular papillary or villous projections. The mucous surface begins to degenerate and hemorrhage appears. In rare cases, the muscular structure is rapidly involved. Generally the tissue involved has a reduction of its vascularity. When the vessels are specially abundant, it is designated as the hemorrhagic or telangiectatic variety.

The appearance of a section of sarcoma is quite varied. The less the connective tissue present, the more homogeneous it appears. Most generally it is marrow-like, and, in advanced stages, presents a soft, smeary, and very fragile mass. With an increase of the connective tissue the borders are folded and irregular, inclosing a homogeneous section. The structure undergoes marked changes under myxomatous alteration or serous penetration, and not infrequently apoplectic nests are recognized and cysts are formed.

The muscular walls are especially resistant, and become thickened, while the disease extends in the direction of the least resistance, which is into the cavity of the uterus. The uterus is usually not enlarged; when it becomes so, it is uniform. The uterus is hard or soft, according to the degree of extension. In rare cases the growth of the disease and uterine hypertrophy are simultaneous. Under these circumstances it attains to the size of a child's head; in rare cases it shifts to the internal os and causes severe hemorrhage, serous discharge, or purulent destruction. In rapid extension the tumor can reach the ribs. Occasionally, it penetrates the uterine wall, projects upon the perito-

neal surface, involves the peritoneum or the intestine, results in suppurative peritonitis, and death rapidly follows. It can become encapsulated and penetrate the intestine or the abdominal wall, and form a fistula. Fistulæ of the rectum and bladder are rare in sarcoma, but frequent in carcinoma. The disease seems inclined to limit itself to the uterus, and metastasis to other organs occurs late. The disease can grow through the uterus and involve the parametric tissue, but this only in advanced cases. A polypoid growth may extend and fill up the uterine cavity and lie upon healthy tissue without involving it.

Sarcoma of the wall appears in a rounded form, with folded or lapped borders. The uterus is hypertrophied. Section of such a tumor shows a yellowish-white or grayish-red surface. The discharge is a milky, soft tissue, and its structure would indicate that it had originated in a fibromyoma. It is very difficult to decide whether the myoma is a cause or a coincidence. A myoma is not infrequently situated near a sarcoma of the mucous membrane, from which it can become involved. Polypoid growths are occasionally the size of a fist, and may have a broad base or a long, thin pedicle. When a polypoid growth pushes into the cavity, the remaining portion of the mucous surface may remain long uninvolved. The existence of the new formation develops an inclination to expel it as a foreign body, by which the os is dilated, and the tumor, hanging by a pedicle, is extruded into the vagina. Portions of the tumor may disintegrate and be discharged. The cervical form of the species is rare, but sometimes projects from the os as a grape-like cluster, which may fill out the vagina and may even project from the vulva. These polypi most frequently originate from the posterior cervical wall, and are soft growths, which show but little inclination to break down.

A second form resembles the cancroid, but is softer, less easily broken down, and does not so rapidly seize upon the other lip. The spindle-cell structure predominates in the cervical tumors. Myxosarcoma and angiosarcoma are very frequent. Sarcoma of the cervix shows but little disposition to invade the uterine body or the vaginal vault. It most frequently penetrates the cellular tissue of the parametrium.

Growths are described as spindle-celled or round-celled, according to the variety of these cells which predominate, as none are pure. The diseased structure is surrounded by a zone of irritation cells, which are difficult to distinguish from the small round cell. Weil reported the growths occurring in the relative frequency of 35 per cent. spindle-cell, 45 per cent. round-cell, and 25 per cent. mixed-cell tumors.

Ruge recognizes four groups: First, giant-cell sarcoma. The

cells of the intervening gland tissue are largely increased. The cells—of round, sometimes spindle, form—are irregularly arranged, and their nuclei often exceed in size the usual cells. Second, the intermediate tissue cells, which are changed in the large spindle form to resemble the decidua cells. They are differentiated by their size, situation, and irregular form. Third, small round or spindle cells, between which lie irritation cells. Fourth, smaller round-cell sarcoma, which shows a great increase of cells, irregular in size and form.

The influence upon the glands of the mucous membrane gives variety. Generally, the glands are compressed and disappear, but occasionally they are retained, and form extensive areas within the tumor, producing what is known as adenosarcoma. The origin of sarcoma is difficult to fix; the microscopic appearance would indicate that it was from the coats of the vessels. A tumor in which there is a great increase of the vessels is known as an angiosarcoma.

Disturbances in nutrition cause edema and swelling of the cells; this condition simulates myxomatous degeneration, and has been called myxosarcoma. Lymphosarcoma is the name applied to those cases in which the disease originates in, and follows the course of, the lymphatic vessels. Myosarcoma is an engrafting of the disease upon a fibroid, and the term adenosarcoma indicates that glandular tissue has been included within the growth. Fibrosarcoma usually exhibits a roundish growth. The entire new formation may present a degeneration into sarcomatous tissue, so that upon section it exhibits a soft, marrow-like structure, or may be somewhat firm and uniformly opaque, with moist or mottled surface. Frequently the tissue resembles fish flesh. At other times the myoma has undergone sarcomatous change only in parts of its structure, and these points of degeneration give the section a striated appearance, in which the nodules are distinctly recognized. The sarcomatous degeneration is most frequently found in the center of the mass, so that it is surrounded by a myomatous crust. Gusserow's assertion that the fibrosarcoma continually loses its capsule is of no significance, for not every myoma has a capsule.

Fibrosarcoma can attain an enormous size, forming a tumor which reaches beneath the ribs. If the tumor is projected into the uterine cavity, it is generally covered by the mucous membrane which is not penetrated by the disease, and occasionally the tumor, thus covered, is extruded into the vagina. The submucous tumor mostly springs by a broad base from the wall of the uterus, in which no sarcomatous tissue is found. If the submucous tumor has attained a large size, disturbances of nutrition may have already occurred, which lead to suppuration. The

longer the growth exists, the greater the inclination to destruction, especially if it is soft and has grown rapidly. In the submucous growth the uterus tends to enlarge, especially when the tumor is of the interstitial variety. On the other hand, the intraligamentary subserous sarcoma produces an enlargement or alteration of the uterus, which should not be overlooked.

These sarcomata, like the myomata from which they mostly project, are but slightly supplied with vessels, though they frequently have a distinct telangiectatic form.

Much diversity of opinion exists as to what constituent of the wall affords origin for the sarcoma cell. Virchow attributed it to the intercellular substance: "Their cells increase by division, they consist more and more of round cells, beginning small, later larger, with considerable nuclei, as large mucous bodies, while the intercellular substance is looser and more spongy." Kahlden believed that sarcomatous degeneration resulted from the immediate transformation of muscle-cells into roundish cells; their poles then became oval or blunted. Whitridge Williams says that under rapid increase of the number of cells this section of tissue passes into pronounced spindle-celled sarcoma with irritation cells. Ricker explains the growth "naturally by a growing through of myoma bundles by the side of the sarcoma tissue." Ruge says, "The impression exists, as if the fine, small muscle-cells passed over directly into the sarcoma cells." Gessner, from extensive investigations, concludes: "The round-cell sarcoma continually takes its origin from the connective tissue, and, likewise, the majority of the spindle-cell sarcoma; but that in all probability to the smallest part they lead back to an immediate transformation of muscle-cells."

593. Etiology.—The cause of sarcoma is unknown. Cohnheim's theory that it originates from some congenital defect affords no further information. In other parts of the body sarcoma is attributed to injury, but the occurrence of rapidly developing sarcoma following trauma is no indication that the latter is the cause. Injuries during parturition, difficult delivery of the placenta, frequent labors, and blows upon the sacrum have been assigned as causes for its development. Labor, however, does not seem to be a factor, as two-thirds of the cases are below the average in child-bearing, and in a great majority there is a long interval between the last labor and the development of the disease. The cervix is most subject to injury during labor, while the body of the organ is more subject to the disease.

Predisposing factors are: *Age.* The cases of sarcoma of the mucous membrane preponderate between the ages of fifty and sixty, although a large number are found between the ages of five and twenty; sarcoma of the wall is absent in the young,

while the maximum number is found between the ages of forty and fifty. *Trauma*, *parasitic irritation*, *syphilis*, and the presence of *fibroids* are included, but, if factors, the query becomes important, Why are the cases not more frequent? Gusserow believed that it originated from changes in the fibroid, and Martin saw the disease follow the ergot treatment of fibroid in six cases. The latter number, however, is too small for a definite conclusion. *Heredity* as a factor is undetermined. *Poverty* has been given as a cause, but Weil has shown that one-fourth of the cases of sarcoma of the mucous membrane have occurred in the well-to-do.

594. Symptoms.—Sarcoma, like carcinoma, presents no characteristic symptoms. The more important indications or signs which should awaken suspicion of its existence are hemorrhage, discharge, pain, and, in advanced stages, cachexia. In more than one-half of the cases bleeding is the first symptom, and is rarely absent. It begins by increased menstrual flow, then a bloody, watery discharge, which is not sudden, as in fibroma, but more or less continuous. It comes from the associated endometritis, while a stronger flow is indicative of destruction of the new formation. Rupture of vessels and more or less severe hemorrhage occur in the diffuse variety, but the polypoid form does not readily break down. In the cervical variety the disease occurs quite early in life. It has been observed at two and one-half years and displays a preference for the young at the period of awakening to sexual activity. The earlier symptoms are similar to those of mucous polypus, such as hemorrhage and discharge. During sexual activity there is first increased menstruation, then irregular discharge of blood, later pain, which results from the pressure of the increasing growth upon the cervix. The extension of the disease to the parametrium causes pressure upon the pelvic nerves and the formation of masses which press up the uterus and lift it out of the pelvis. The hemorrhage and diffuse discharge result in a high degree of anemia, and finally cachexia appears, and the patient ultimately perishes from marasmus and the penetration of the disintegrating tumor into the abdominal cavity with fatal peritonitis. In the frequently recurring sarcoma of the mucous membrane, which appears at the climacteric, hemorrhage is the first, and often for a long time the only, indication of the disease. The obstruction to the uterine discharge will frequently result in the formation of a pyometra or hematometra and the development of a tumor, which will reach to the ribs. The uterine collection may be bloody or mixed with tissue and it often attains an enormous size. Discharge is the first symptom in about one-fourth of the patients and does not cease with the further progress of the disease. It

begins as a quite abundant, thin, watery fluid, which is later mixed with blood. Such a discharge continuing for a length of time as the only symptom should arouse a suspicion of the existence of sarcoma. It is true that discharges of this character are not rare as a symptom of submucous fibroids, but its occurrence after the menopause is an almost positive indication of sarcoma. In the first stage there is no disagreeable odor beyond the stale sweetish smell, but with the destruction of the new formation the discharge becomes purulent, sanious, and has a foul odor. The carrion-like smell so characteristic of cancer is not usually present, because the large collections in the uterus are retained by the obstruction, and owing to the arrangement of the vessels are afforded better nutrition, so that the new structures do not so easily break down. The disease generally appears in the polypoid form. Sanious discharge occurs when the uterus forces the new growth out, the os is dilated, and the diseased mass is extruded into the vagina. The extruded parts are to some degree deprived of nutrition, and this results in further destruction. The discharge in the vagina has abundant opportunity for exposure to infection from saprophytes, which accelerate the rapidity of destruction. It is then mixed with ulcerative pieces of tissue, which are often thrown off in large masses, and these still further disintegrate in the vagina. A bloody discharge will follow and pyometra can occur, but this never attains the same extent as the hematometra. Pain is absent at the beginning of the attack, but is aggravated with the increase in the size of the uterus, the persistent pressure in the pelvis, and the sensation of fullness in the abdomen. As the uterus becomes enlarged, pain is referred to the ileum or to the sacrum and radiates down the thighs. The extension of pain is due to the involvement of the uterine nerve-endings by the new formation. Pain is greatly aggravated when the disease has passed beyond the boundaries of the organ and infiltrated the pelvic tissues and made pressure upon the large nerve-trunks. In the polypoid variety the pain becomes labor-like when the structure attains a size which leads the uterus to expel it. Painful attacks do not occur at such regular hours as in carcinoma. Inversion of the uterus has been caused by the efforts of the organ to expel its contents. Vesical symptoms are comparatively frequent when the disease is confined to the uterus and are manifested by more frequent desire to urinate, pain in evacuation, and distressing vesical tenesmus. These symptoms are more particularly seen in the circumscribed variety and are, consequently, not the result alone of increased weight. In advanced stages constipation is marked from pressure of the infiltrate upon the rectum and partly from decreased nutrition. Such patients

apply for relief from constipation and the pain at stool. The infiltration of the uterus can attain to considerable dimensions, but, unlike carcinoma, shows but little inclination to compress or involve the ureter. As the cervix is rarely involved, vesical and rectal fistula are infrequent. The constant drain will necessarily affect the general health and the cachexia is greater than in cancer. In sarcoma of the uterine walls, frequently known as fibrosarcoma, the great diversity of symptoms depends upon the situation of the disease, and makes it impossible to present a clinical history as in other forms of trouble. However, one of the first signs is an irregular bleeding, following the menopause, in a woman who has had a myoma. The myoma rarely delays the climacteric longer than the fifty-fifth year. The continuation of the menses at an advanced age or their return after ceasing should indicate the probable degeneration of an existing myoma. Following the climacteric, the myoma ordinarily ceases to grow or decreases in size, while a sarcoma of the uterine wall increases. A rapid growth subsequent to the climacteric is with rare exceptions an indication of sarcomatous degeneration of a myoma. A symptom constant in sarcoma and always absent in myoma is a premature and rapid cachexia. From great loss of blood, the myoma may cause anemia, but the sarcoma causes emaciation. When the cachexia occurs without much loss of blood, it indicates an unfavorable influence upon the blood composition and formation. The cachexia is preceded by a sense of weariness, pain in the head, nausea, sleepiness, and universal pain throughout the body. Furthermore, there is a sensation of tension in the belly without marked increase in the tumor. Difficulty with urination without compression is also present and disturbance of nutrition without other assignable cause is quite marked. A profuse watery mucous or watery bloody discharge occurs similar to that from an ulcerating submucous myoma, except that in the latter the growth is not discharged in pieces, but the tumor retains its integrity and disintegrates from the surface, while in sarcoma large portions of the mass are thrown off or are easily broken off by the hand. Pain is produced when the disease breaks through the walls of the uterus and undergoes great extension. Labor-like pains are caused if the uterus attempts to discharge its contents. Sarcoma occurs in but a small percentage of cases of myoma, yet sufficiently often to justify it being reckoned as a factor. While the possibility of this degeneration is no indication that every patient suffering from myoma should be subjected to an operation, still it is a warning which should awaken suspicion when adverse symptoms develop in the tissue thus affected. Paget described a peculiar form of this disease under the designation of recurrent fibroids. Whether

in these cases successive mucous fibroids were discharged or the condition was sarcoma from the beginning only the microscope could have determined. Schröder made a vaginal extirpation in a patient from whom he had removed seven successive polypi, the last three of which were sarcomatous. The removal of the sarcomatous growth long years after previous removal does not prove that the former was malignant. The possibility of such changed tumors occurring should be decided by the more frequent examinations with the microscope, in order that extirpation may be promptly resorted to when malignancy is demonstrated.

It is asserted that metastasis is late in its occurrence in fibrosarcoma. This assertion is correct only as to the length of time symptoms exist prior to such manifestations, but does not indicate the long existence of sarcoma.

595. Duration.—The duration of the disease in sarcoma of the cervix is about the same as that of cancer of the part—namely, about one and one-half years. It is more difficult to fix the term of the disease in the variety involving the uterine mucous membrane, as the earlier symptoms do not come under the observation of the physician. Cases have been reported as having survived several years; the average duration, however, is about two years. The polypi is slower in its progress, probably dependent upon a slighter inclination of this form to invade the muscle wall. Metastases occur in about one-fourth the cases and affect any tissue in the body. The structures most frequently affected are the lungs, peritoneum, lymph-glands, and intestines. In the cervical variety it is likely to extend to the vagina, where the involvement is superficial and does not interfere with cure if extirpation of the uterus is performed, provided the operation is done early. To afford hope of recovery the diagnosis must be made early, and not after the recurrence of the disease following curetment or amputation of the cervix has demonstrated its malignant character. The polypoid growths from the cervix should be recognized by their peculiar appearance, and the microscopic examination of the cureted scrapings should render the diagnosis certain. The re-formation of the polypus should lead to the suspicion of malignancy, and a careful microscopic examination should be made to determine its true character. In the fibrosarcoma it is still more difficult to fix the duration of the disease, as we have no means of knowing when the degeneration of the fibroid begins. Cases have been reported in which tumors existed for ten years. These are probably cases in which the myoma has existed for a long period and only in the later years become malignant. Metastases in this form appear late, follow the course of the blood-vessels, and, like the other forms of the

disease, involve the lungs, pleura, liver, rectum, omentum, and kidneys. Fibrosarcoma is frequently regarded as a comparatively benign tumor, because it remains proportionately limited to the uterine cavity, but this is incorrect, for this property is common to mucous membrane sarcoma and cancer of the body of the uterus as well. If metastasis is any criterion as to malignancy, we must regard parenchymatous sarcoma as more malignant than the mucous, for in the latter metastases occur in only one-fourth of the cases, while in the former but one-fourth escape. Although it is impossible to fix the duration of life, it would seem to be longer than in the other forms of malignant disease. Its progress is attended with the same symptoms as in other forms of malignancy. Its termination is usually death from exhaustion, bleeding, and discharge, and by the further extension of the disease into the various parts of the body. Sepsis plays a less important part than in the mucous variety, and ulceration does not appear so frequently, and, when present, by the evacuation of the ulcerating mass does not usually cause general symptoms, though a purulent peritonitis has been frequently reported as a cause of death.

596. Diagnosis.—Sarcoma of the mucous membrane can be accurately determined only by microscopic examination. Other means will be sufficient to render certain the existence of malignant disease, but the variety is determined only by the microscope. Neither the condition nor symptoms offer anything characteristic of sarcoma, while a majority of the diseases of the uterus afford similar symptoms.

An elderly woman with a large uterus, who suffers from a profuse watery discharge mixed with blood, should be suspected of having sarcoma. Submucous myoma sometimes causes a similar discharge, but the uterus is greatly enlarged, and it does not occur for the first time in advanced age, and is always accompanied with bleeding.

Senile endometritis may cause a profuse discharge, but the discharge is purulent, and generally has a disagreeable odor. The organ presents the characteristic changes of old age, and is not large.

A second suspicious sign is vesical tenesmus, which should be regarded as an indication of malignant disease when no other cause exists.

Sarcoma of the uterine body is naturally difficult to diagnose. It can be completely covered by the cervix and the vaginal portion, and when a large cauliflower-like mass projects from the cervix, it can be either sarcoma or cancer, and the microscope only can determine which. In the differential diagnosis there are a variety of diseases which must make the diagnosis only probable.

The uterine body is always enlarged, but does not differ essentially from the enlargement of chronic metritis, myoma, and carcinoma. The sarcomatous uterus is not so hard as the myomatous organ. In malignant disease the very much enlarged organ indicates sarcoma, but the carcinoma may be superimposed upon a myomatous uterus. In the latter the form of the uterus is irregular.

Fungous endometritis, a mucous polyp, and submucous fibroid may require the use of the microscope to differentiate them.

Fig. 502.—Fibroma Undergoing Sarcomatous Change.

Positive proof of malignant disease is not obtainable by the touch. A sensation of softness is common to mucous polypi, submucous myoma, and mucous membrane sarcoma. Pieces of the latter can be broken off with the finger, as also from other growths when ulcerating. Touch with the finger is not always free from danger. It will be safer to employ the microscope upon the scrapings obtained by curetment.

The inexperienced investigator may be confused by the resem-

blance between sarcoma and interstitial endometritis, with more or less destruction of the glands. In doubtful cases examine all the parts removed before making the decision that malignant disease does not exist, and, if then in doubt, keep the patient under close observation. If she continues to bleed, make a second curetment, and again examine the scrapings.

The abundance and variety of the cells in a specimen are of significance in the diagnosis of sarcoma. In round-cell sarcoma the cells are round and thick, and exceed in size those of the intermediate gland tissue, between which are found irregular cells. Kellar places particular stress upon the fact that the individual nucleus is differently formed and varies in the way it accepts the color stain, so that the smaller nuclei are always better colored than the larger. When the glands are absent, the cells are usually pressed together and the epithelium is flattened. If the glands have largely decreased in interstitial endometritis, there are distinctive traces of connective-tissue formation in the intervening structure, which is penetrated in all directions by the migration of connective-tissue cells. They differ from spindle cells in that the long axis is drawn out at the ends, and the long axis of the nucleus does not fill out the body, while in the spindle-cell sarcoma the cells are smaller, plumper, only rarely with pointed ends, and the nucleus almost fills out the body.

The distribution of the vessels is also very significant. In benign changes of the endometrium the blood-vessels are few, and present distinctive walls, while in sarcoma they are much more abundant, and appear in immediate relation to the surrounding tissue of the growth. Amann asserts that the recognition of abundant nuclear division can be employed for the diagnosis of sarcoma.

In the differential diagnosis of subinvolution of the decidua and incomplete abortion the clinical history is of advantage; but if long-continued, irregular menstruation is followed by severe hemorrhage, perhaps an offensive discharge, while the uterus remains large and not especially hard, confusion with sarcoma is possible, which will require the microscope for confirmation, and then not always with certainty. The individual decidual cells closely resemble those of sarcoma of the mucous membrane. The retained tissue glands will present the alterations of pregnancy in their epithelium to such a degree that the error is easily avoided. The difficulty will be greater when a retrogression of the decidua has occurred, for the uniform structure of the decidua is destroyed. In single sections, however, individual islands of the decidual structure will be found, while other sections will show a great irregularity in the cells. The size of the cells is quite variable; frequently the decidual cells show a pronounced spindle

shape, and penetration of the tissues by round cells exists, so that a structure is formed which is extraordinarily like a sarcoma. Differentiation is easily accomplished in such cases by demonstrating the chorionic villi. If we find the decidual cells by curetment of a woman who has had an abortion months before, we will also find the chorionic villi present, for the decidual cells are not otherwise so long retained. In the absence of the chorionic villi the diagnosis is fixed by finding, near the large decidual cells, sections of tissue which show the unaltered mucous membrane with retained glands or with the recognizable alterations of interstitial endometritis.

Tuberculosis of the endometrium, by the premature loss of the glands, through the appearance of numerous round cells in the tissue, and the occurrence of irritation cells, causes confusion with sarcoma. The clinical history, the demonstration of caseation, the peculiar irritation cells of tuberculosis, and the rarely demonstrated tubercle bacilli will protect against confusion.

Carcinoma of the Uterine Body.—There are certain forms of cancer which can not be distinguished microscopically from sarcoma. We can, however, determine that malignancy is present.

As in the mucous sarcoma, the diagnosis is made only by microscopic examination of the discharged or removed pieces of the growth. Greater difficulties are experienced in securing the material for study than in the latter. A suspicion that fibrosarcoma exists should be awakened:

First, if a myomatous tumor does not cease to grow after the menopause. Rapid growth does not always follow sarcomatous degeneration.

Second, if a woman with a myomatous tumor commences to bleed after the menopause. In rare cases this may occur in advanced age from mucous polypi, but the association of a profuse watery discharge should be held to be very suspicious of sarcoma.

Third, if with a myomatous tumor cachexia occurs. Through excessive bleeding myoma causes anemia, but never cachexia.

Fourth, if a myomatous tumor occasions symptoms which are explainable neither by the size nor the situation of the tumor.

Fifth, if ascites complicates the tumor. The possibility of its being caused by other conditions must be excluded. Ascites occurs from penetration of the peritoneum by the disease, and may follow a subserous tumor which has become sarcomatous.

Sixth, if a myoma which was previously hard grows rapidly, and becomes soft and swollen.

Seventh, if after the removal of a fibrous polypus another follows.

597. Recurrence.—The tendency of the disease to return even

seems greater in the fibrosarcoma than in the mucous growth. It is probable that the explanation of the greater frequency of the occurrence in the former is due to the early recognition and more prompt treatment of the latter. When a case of mixed sarcoma remains a year free from recurrence it may be considered as cured, but not so the fibrosarcoma, for it has been known to return at a much later date. The great difficulty in the treatment of this as in all malignant disease is the impossibility of determining the diagnosis before the disease has extended beyond the point at which it can be surely removed. Our results must continue bad until both patient and physician have learned to realize that uterine hemorrhage is a symptom which demands prompt and thorough investigation. When the disease has so extended that a radical procedure is no longer indicated, we direct our efforts to the arrest of hemorrhage, the decrease of discharge, and the improvement of the general condition of the patient.

Chorio-epithelioma.—This is a condition which it will often be possible to determine by touch through an accessible cervical canal. But little satisfaction will be secured by examination of the tissue removed by the curet, as it will consist mostly of blood-clot containing a few pieces of necrotic tissue.

598. Treatment.— Whenever possible, the uterus should be extirpated. No other measures are worthy of consideration, but the case must come under observation sufficiently early to admit of the extirpation of the organ within the limits of healthy tissue.

Operation is contraindicated when the disease has so broken down the system of the patient that she will be unable to endure the ordeal of a radical procedure. It is also contraindicated when the growth is no longer confined to the uterus. The existence of metastases and the extension of the disease beyond the confines of the uterus would render operation of no avail. This assertion does not apply to extension upon the vagina, if the disease can be removed. The existence of ascites must not influence against the procedure unless the involvement of the retroperitoneal glands can be demonstrated. The removal of the entire uterus, even in slight cases, is indicated, because it affords greater immunity against return than any partial operation. When the size of the uterus permits, the operation should be performed by the vagina. This can usually be done in cases of mucous sarcoma, as the organ is rarely of large size. The fibrosarcoma may often be scraped out and the size of the organ may be reduced by the administration of ergot for a few days, and then the vaginal operation may be performed. It is unwise to subject the healthy tissues to infection by cutting up the tumor to reduce its size.

599. Treatment Following Operations for Malignant Disease.—The patient should be kept in the horizontal position, though she may be permitted to change from one side to the other frequently. The urine should be emptied with the catheter only when she is unable to void it spontaneously. The bowels should be evacuated at the latest by the third day. She should be given:

℞. Hydrarg. chlor. mitis,.....gr. ½
Sodii bicarb.,.....gr. ij.
M. ft. capsul. No. i. S.—One capsule every fifteen minutes until gr. iss–ij are taken.

And this should be followed by either a seidlitz powder, effervescent magnesia citrate, eight ounces, or magnesia sulphate, dram i every hour, until a free evacuation is secured. The appearance of tympanites should indicate the employment of stimulating enemata to promote increased peristalsis. An enema of alum, one ounce to the quart of warm water, is very effective in promoting evacuations of gas.

If the abdominal wound is closed, the vaginal tampon of gauze may be permitted to remain for from six to nine days. After purification of the vagina the gauze should be replaced. If the stumps have been tied with silk, it is not always possible to remove them all, and granulations often spring up about the ligatures and grow into the vulva, resembling a raspberry. With such a growth may result a similar process in the mucous membrane, so that a hen's-egg-sized growth projects from the angle of the vagina, which readily bleeds upon being touched, and at once awakens a suspicion of recurrence. Bimanual examination, and especially a microscopic investigation, will disclose its true character. In the third week the patient is permitted to arise, and in the fourth to go about the house. When clamps are used instead of ligatures, the weight and dragging of these instruments increase the pain. The distress is aggravated by every movement, and frequently morphin may be required to make it endurable. The difficulty is often increased as early as the day after the operation by an accumulation of flatus. In the majority of cases the difficulty appears later, and is relieved only after prolonged rectal irrigation. The meteorism, increased abdominal sensibility, enhanced rapidity of pulse, and elevation of temperature produce anxiety, which is aggravated by prolonged vomiting and other signs of ileus. A number of cases are reported of a fatal result from kinking of the intestine. The continuation of such symptoms should lead to removal of the gauze, for fear that it is causing the obstruction. This is done with the recognition of the fact that the adhesions are not firm, and

that trouble can arise from its premature removal. The cavity should be tamponed lightly. In the removal of the gauze care must be exercised that a knuckle of intestine is not drawn into the vagina. Such an accident occurred in one of my patients, where the interne withdrew the gauze and found that there was a large coil of intestine in the vagina, which he could not replace. I placed the patient upon her side with the hips elevated, and had no difficulty in replacing the intestine, which was kept in place by a gauze tampon. As to how long the gauze shall remain, operators differ—from the one or two days of Doyen to the ten days of Zweifel. The latter prefers the longer period because the earlier removal of the gauze breaks up the adhesions and draws down the intestines; at the later period the gauze has become loosened and the intestinal adhesions are so firm that they are undisturbed.

The clamps are generally removed at the end of forty-eight hours. Landau and Seligman remove them on the second day. I have had several cases of quite severe hemorrhage after removal at the end of forty-eight hours—hemorrhage which is difficult to control. The occurrence of hemorrhage requires resort to exposure of the cavity by retractors, and the ligament must be followed up and the bleeding vessels again secured with forceps.

Another objection to the use of clamps is the danger of injury to the ureter and the bladder, but this is due to want of care in pushing away these organs, and is just as likely to occur from careless use of the ligature. Injuries of the rectum are also reported, but are less excusable than those of the urinary apparatus. Among the causes of fatal result sepsis is the most frequent.

FALLOPIAN TUBES.

600. Tumors (Benign).—Tumors or growths of the tubes are exceedingly rare, except as a result of inflammatory changes.

601. Fibroma or myoma is infrequent and of small size. It develops from the muscular tissue of the tube, and may grow inward or become subperitoneal, but rarely obstructs the lumen of the tube. Inflammatory and tuberculous changes have been mistaken for myoma, particularly the condition known as salpingitis nodosa. Under the name of adenomyoma or cystadenoma Recklinghausen describes a peculiar form of myoma which occurs only in the uterus and tube. It is characterized by the usual constituents of the fibroid, which include glandular structure. In the tube he attributes it to some remains of the primordial structure—the Wolffian body.

602. Fibrocyst.—A unique new formation is described by

Sänger-Barth which consists of three tumors collected from a conglomeration of various large cysts and firm tumors that were in part pedunculated from the fimbria of an otherwise healthy tube. Microscopically, the wall of the cyst consisted of fibrous connective tissue with smooth muscle-fiber, and, within, a nest of embryonic tissue. Its surface was covered with ciliated epithelium, and the contents of the cyst were detritus. The principal mass of firm tissue partly consisted of gelatinous myxomatous and partly of loose cell tissue. The products greatly resembled a teratoma.

603. Enchondromata are small, semitransparent, cartilaginous masses, which are occasionally situated upon the ends of the fimbriæ.

604. Dermoid of the tube is exceedingly rare. Ritchie describes a plum-sized bone removed from a dermoid of the tube. Pozzi, in a recent edition of his work, presents a diagram of a dermoid cyst removed from the tubal wall, which was adherent to the ovary. It had developed within the tube and ulcerated through the overlying wall.

605. Cysts of small size are frequent, though their true cystic character is denied. The large irregular bullæ so common in association with fibroid growths are said to be dilated lymph-spaces. Cysts varying from the size of a pea to that of a walnut are found in all the walls of the tube, but most frequently beneath the peritoneum. Cysts within the tube are not infrequently the result of inflammatory changes by which the adjoining folds of the mucous membrane become adherent. Cysts of the tubal fimbriæ become pedunculated and resemble the hydatid of Morgagni, which is by some regarded as a cyst. The cysts contain clear serum, colloid masses, or chalky bodies. Sänger divides these cysts into:

1. Serous cysts, which arise by the accumulation of serous fluid between the lamellæ of the new mucous membrane. They can attain the size of a child's head, and may be either single or double.

2. Lymphangiectasia and lymphangiectatic cysts in three forms: (*a*) As small vesicles upon tube and ligament, identical with those of older authors; (*b*) winding, ramifying tubes with constrictions and cystic distentions; (*c*) lymphangiectatic cysts—large, tough-walled, isolated cysts in the tubal serous covering or the mesosalpinx. The two latter occur especially with uterine myoma.

3. The hydatid of Morgagni, regarded as a physiologic cyst of the end of a tubal fimbria.

Inflammatory cysts of the tubes—known, from the character of their contents, as hydrosalpinx, pyosalpinx, and hemato-

salpinx—have been discussed under inflammation. (Section 383.)

606. Polypus is a rarely recognized growth. Lewers reports a case in which, upon the inner surface of each dilated tube, were numerous growths, varying in size from a pin's head to a pea. Amann speaks of a growth of the mucous membrane consisting of connective tissue covered with enormously folded cylinder epithelium. Rokitansky and Klob describe connective growths of the fimbriæ.

607. Papillomata, denominated by Sutton as adenomata, are allied to the condylomata, or warts, found upon the vulva. The villus consists mainly of epithelium. Sänger has collected six cases, and divides them into two forms: (1) Simple cystic; (2) hydropic.

The simple cystic is an indefinite soft growth from the mucous

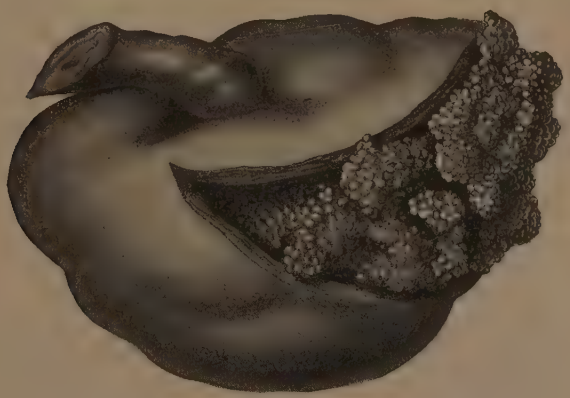


Fig. 503.—Papilloma of the Fallopian Tube.

membrane, of a cauliflower-like appearance (Fig. 503), and its villous structure may fill out the tube and distend it into a considerable sized tumor.

In the second form (cystic and vesicular papillomata) the tubal end becomes closed and the villi are so swollen as to give the appearance of a cystic mole. This form differs from the first in the greater size of the cavity from the inner surface of which spring the papillary masses. Doran and Sutton have attributed the occurrence of papillomata to previous gonorrhea, but with such a cause they should occur more frequently. They are difficult to differentiate from sarcoma and cancer. Their benignity, however, is proved by the absence of any tendency of their epithelium to atypic growth, and there are no metastases.

608. Malignant Tumors.—Carcinoma of the tube may be

either primary or secondary, though the latter is the more frequent. Secondary involvement of the tubes from cancer of either the ovaries or the uterus is comparatively late, as we not infrequently find the ovary forming a large tumor from cancer or sarcoma without any involvement of the tube. Doran divides primary cancer of the tube into two forms:

1. When the cancer develops in the mucous membrane of a normally formed tube.

2. When it forms in a malformed tube bearing a cyst the wall of which becomes infected.

In the first form its situation shows its origin in the papillary structure—whether from degeneration of papilloma, as believed by Doran, or directly from the tubal mucous membrane, as asserted by Sänger-Barth, remains to be determined. The occurrence of the disease in the middle and external portions of the tube indicates that it is a sequel of inflammatory trouble.

In the second form the disease develops in a cyst of the ostium. Doran describes a specimen in which the end of the right tube was dilated for an inch and a half, was very tortuous, and formed a tumor an inch in diameter at its widest part. In its wall was a solid deposit, over a quarter of an inch in thickness. At its outer part it communicated with a thin-walled cyst, situated in the anterior part of the broad ligament, lifted up its anterior fold, and raised the serous coat of the uterus. The cyst was about six inches in diameter, and its interior contained a thick deposit which appeared encephaloid in character. Under the microscope the stroma was scanty, with wide alveoli containing great masses of cubic epithelial cells, as in encephaloid cancer.

Amann is inclined to believe that cancer of the tube will prove to have developed through metastases from the uterus. The disease is generally confined to one tube. The recognition of its existence is necessarily difficult. When, after previous pelvic inflammation, a patient who has reached her forty-fifth year shows a sudden or steady growth of subjective and objective symptoms, cancer, says Doran, may be suspected, and watery or sanious discharges greatly increase the suspicion of malignancy.

Treatment should consist in the prompt removal of all infected structures.

609. Sarcoma of the ovary is frequent; of the tube, very rare. Occasionally, the sarcomatous nodules are found scattered over the peritoneal surface of the tube, but the disease more frequently passes from the ovary to the omentum. Kahlden reports a case in a woman of fifty-one years, in which the tube

formed a sausage-shaped mass filled with soft cauliflower-like material. Under the microscope it showed various degenerations, such as round-cell and spindle-cell sarcoma, and a papillary structure wanting in connective tissue. These formations were found to arise from the endothelium of the lymph-vessels, which was increased several layers. As important constituents could be shown irritation cells similar to those in sarcoma.

610. Chorio-epithelioma Malignum.—Just as malignant degeneration can occur in a portion of placenta or chorion which is retained in the uterus, and produce a large tumor and subsequent metastatic deposits in the abdominal and thoracic viscera, a similar malignant change may follow an ectopic gestation in the tubal sac. Sänger advances this as an additional argument for active interference in such cases, and for the extirpation of tubal moles and of the appendages when tubal abortion has occurred.

BROAD LIGAMENTS.

611. Cysts of the broad ligament varying in size from a pea to a pigeon's egg are frequent, and generally of but little clinical interest. They may be situated upon the surface of

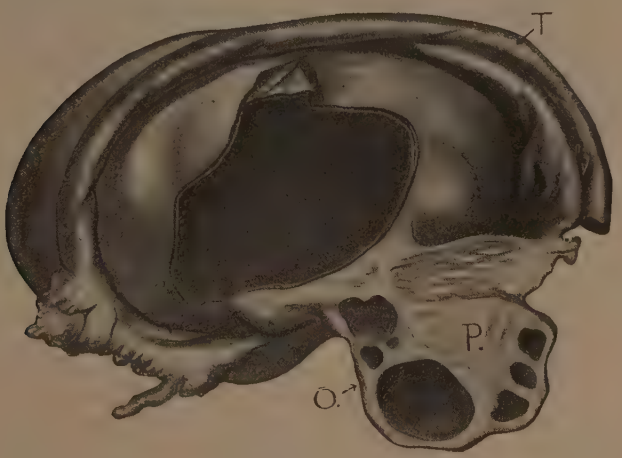


Fig. 504.—Broad Ligament Cyst.
T. Fallopian Tube. P. Parovarium. O. Ovary.

the ligament or may lie deeply within its folds. Their walls are thin and the contents of the cyst consist of a watery or pale colored fluid. Superficial cysts are of undetermined origin, while the deeper growths are attributed to changes in the par-

ovarium. I recently removed a multilocular cyst from the anterior surface of the broad ligament by opening the overlying peritoneum and enucleating the cyst. The ovary was not affected and was left undisturbed. These cysts are frequently pedunculated, but rarely attain to any great size. They are generally called microcysts, and are often developed in the structure or suspended from the organ of Rosenmüller. Only those which develop from the vertical tubes of the parovarium have ciliated epithelium and are liable to form papillary growths subsequently.

Parovarian Cysts. (Section 628.)

612. Echinococcus cysts are rare, except in certain districts, notably Iceland and Mecklenburg. They primarily occur in the pelvic connective tissue, and always near the intestine.

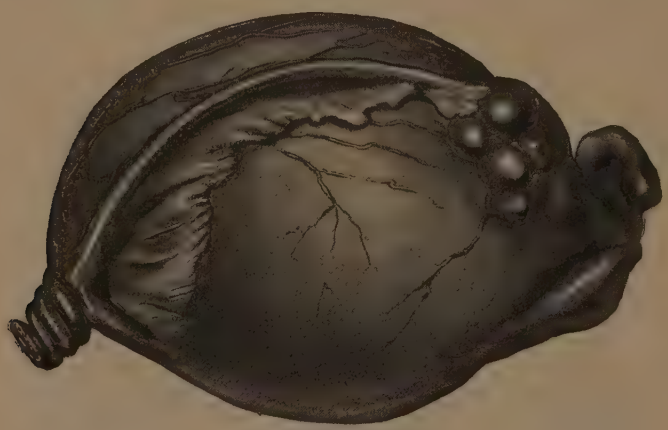


Fig. 505.—Broad Ligament Cyst, with Torsion of Its Pedicle.

The wandering of the parasite causes a chronic inflammation, characterized by round, elastic tumors situated near the rectum, which are slightly movable, but not painful. Bimanual palpation reveals that they are not connected with the uterus or ovaries. A positive diagnosis is to be determined only by a careful examination of the fluid obtained from the cysts, either by spontaneous rupture or by puncture. The danger of infection from it is so great that the certain determination of the disorder will not compensate for the increased peril induced by the puncture.

Treatment.—The proper plan of treatment consists, when possible, in the removal of the sac. If we are unable to scoop out the cyst, then it should be fastened to the abdominal wall and drained. Pozzi advocates, when we have had to open

the peritoneal cavity, that the opening over the cyst should be packed with iodoform gauze for from twenty-four to forty-eight hours, until adhesions have formed, before the cyst is opened, when it can be done without danger of infecting the peritoneal cavity. If the tumor is situated low in the pelvis, a vaginal incision should be preferred. The sac cavity should be emptied and packed with gauze.

613. Parovarian Varicocele.—Phleboliths.—A varicose dilatation of the veins of the pelvis is common, and frequently, according to Klob, results in the formation of phleboliths. Their frequent occurrence is attributed to the rare presence of valves in the veins of the broad ligament. These masses attain the size of a pea or bean, and occasionally cause inflammation and thrombus formation. When situated so that they can be palpated through the vagina they are often mistaken for ureteral calculi.

614. Lipomata.—Small collections of fat are not infrequently found in the mesosalpinx of the broad ligament near the under surface of the tube. They can attain the size of a bean, occasionally the size of a walnut.

615. Fibroma.—As the same muscular structure is found in the broad ligament as in the uterus, it is not surprising that fibroids should occasionally be found in the ligament independent of the uterus and its structure. Such growths may spring from the round ligament or are found in the broad ligament. The latter have been considered as aberrant uterine fibroids which have become separated from their first attachment. Sänger found these growths most frequently upon the right side. They may be situated intraperitoneally, in the fold of the groin, or in the labium majus. The mass may have a pedicle or may be sessile. It does not attain a large size, is quite movable, and is not painful. The condition may be confounded with fatty hernia, an epiplocele, or an ovarian hernia. The fatty hernia is frequently reducible, painful to the touch, quite soft, and ill defined. The irreducible epiplocele becomes like a fibroid, but has a cord stretched behind the abdominal wall. In an ovarian hernia the tumor retains the shape of the organ, is exceedingly sensitive, and increases at each menstrual period, while the uterus is displaced to one side. The treatment is extirpation.

616. Malignant Growths.—Carcinoma and sarcoma of the broad ligaments are usually the result of extension of the disease from the uterus or ovaries. The rectum, the bladder, or the retroperitoneal glands may be the source of the infection.

OVARIAN TUMORS.

617. Characteristics.—The tumors of the ovaries differ from the neoplasms of the other portions of the genital tract in their greater propensity to malignant degeneration, often rendering it difficult to determine whether an individual growth is malignant or benign. For this reason we will depart from the custom we have previously followed and discuss the two classes of tumors together.

618. Classification.—The tumors of the ovary are divided:

- Clinically
  - Cystic
    - Simple.
    - Proliferating.
    - Dermoid.
  - Solid
    - Fibromata.
    - Sarcomata.
    - Carcinomata.
    - Endotheliomata.
- Pathologically
  - Simple.
  - Proliferating.
  - Dermoid.
  - Parovarian.
- According to size
  - Small.
  - Large.

Cysts may originate in any part of the tubo-ovarian structure, as the cortical, medullary, or parenchymatous portions of the ovary; in the structure between the tube and ovary known as the Rosenmüller organ or parovarian structures; and in the hydatid of Morgagni, the extremity of the canal of Müller. We have already spoken of cysts which develop in the folds of the broad ligament and are recognized as broad ligament cysts. Cystic growths may become of almost unlimited size, larger than any other growth of the body, and occasionally the body may seem but an appendage of the tumor. These growths repeatedly reach the weight of 100 pounds. Maritan reported an ovarian cyst weighing 200 pounds removed from a woman who previously weighed 290. (Fig. 506.) Her girth measure was ninety inches. Bullitt removed a tumor whose sac and contents weighed 245 pounds.

The solid tumors are much less frequent than the cystic and closely retain the shape of the ovary. The cystic are irregularly spheric, the more spheric, the larger they become. As a rule, the surface is a bluish-white, greenish, brownish, yellow, or a glistening white. Secondary developments may occur in the wall, giving it an irregular shape, or it may consist of a large number of small cysts, which give the impression of a solid tumor.

Cysts are still further divided into unilocular or single cysts,

and multilocular, where the sac is composed of a number of cavities or smaller cysts. Careful examination of a unilocular cyst will not infrequently show smaller cysts within its walls.

The contents of the various tumors greatly differ; indeed, the different cysts in the same tumor show radically different contents. In the unilocular tumors the contents are usually clear and limpid; in the multilocular, thick, viscid, and glue-

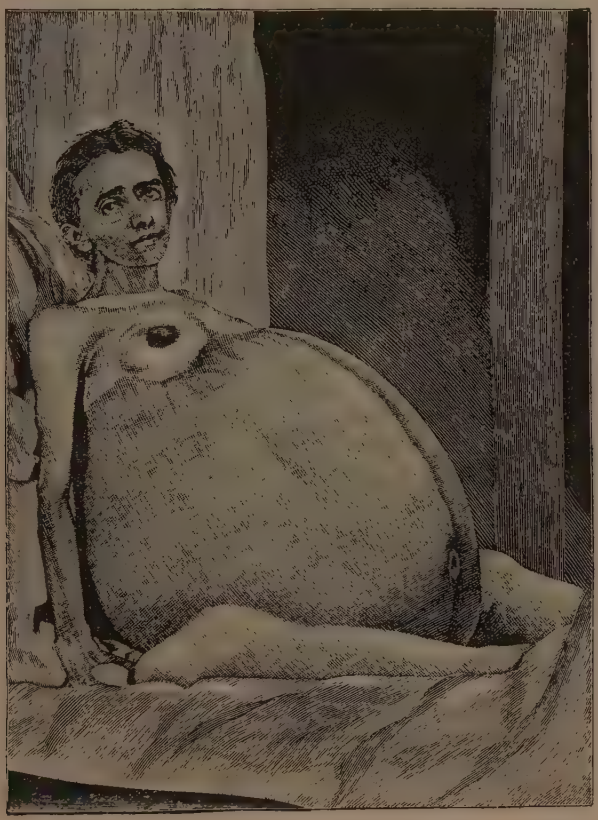


Fig. 506.—Large Ovarian Tumor.

like in some, clear and limpid in others, while, from various causes, there may be discoloration by an admixture of blood, pus, or fat.

The broad ligament cysts are generally unilocular and contain a clear fluid; those which originate in the hilum are papillary; and those from the parenchymatous structure of the ovary, glandular.

Small Cysts.—The small cysts comprise:

Small residual cysts.
Follicular cysts.
Cysts of the corpus luteum.
Tubo-ovarian cysts.

The large cysts are:

Glandular proliferous.
Papillary proliferous.
Dermoid.
Parovarian { Hyaline. Papillary. Dermoid.

619. Small residual cysts are growths which develop in the structure between the tube and ovary, known as the parovarian structure, or the organ of Rosenmüller. Those which develop in the vertical tubes have ciliated epithelium, and may

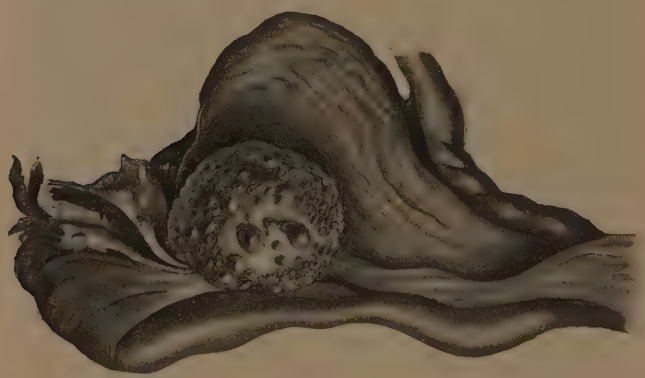


Fig. 507.—Small Residual Cysts.

subsequently develop into papillary growths. They may become detached from the ligament and hang from the peritoneal surface by a slender pedicle. It is possible that from these cysts may originate large cysts filled with either fluid or papillary contents.

Attached to the fimbriated end of the tube is generally found a small cyst, varying in size from a pea to a cherry, known as the hydatid of Morgagni, which, from its almost continuous presence, is regarded as a physiologic cyst. This hydatid is the termination of the duct of Müller. It is transparent, has a thin wall, and has a pedicle often a full inch in length. Doran describes a supratubal cyst of similar size, appearance, and structure, which he supposes to be a microcyst of the broad ligament in this anomalous position.

620. Simple or Follicular Cysts.—Hydrops Folliculorum.—These cysts are unilocular dilated follicles, generally multiple and small. In an ovary that has not attained to twice its normal size, fifteen to twenty of these cysts may be found. When small, the ovary is but slightly enlarged and the follicle projects upon the surface or lies embedded in the stroma. These cysts were long considered the sole source of large ovarian cysts, but it is only in rare instances that they attain the size of a fist, occasionally of a man's head. The contents of the

Fig. 508.—Cyst of the Corpus Luteum.

cyst are generally clear, but may be blood-stained, and have a specific gravity of from 1005 to 1020. The cyst-wall is a transparent, thin membrane of a light gray color, covered with columnar epithelium. The cysts may be few and the stroma excessive, or the former may be very numerous and the latter scanty. When the latter condition is present, the ovary is frequently converted into a mass of delicate cysts. It is not unusual to find an ovary otherwise healthy containing a uni-

locular cyst the size of a hen's egg. The disease is generally bilateral.

Etiology.—These cysts, even when large, are regarded as unruptured and dilated Graafian follicles, because of the gradations observed between them and the smaller cysts. In the smaller ones ovula may be detected, which have been destroyed or have escaped observation in the larger. Failure to rupture and increase of the fluid contents produce a dropsy of the follicle. The normal rupture may be prevented by undue thickness or toughness of the walls, the result of inflammation; by deposits of exudation over the surface of the ovary; or by the deep situation of the developing follicle; or failure may be the result of too slight congestion, which, though increasing the secretion, is too gradual to produce rupture. Such cysts have preceded menstruation, being occasionally found in the

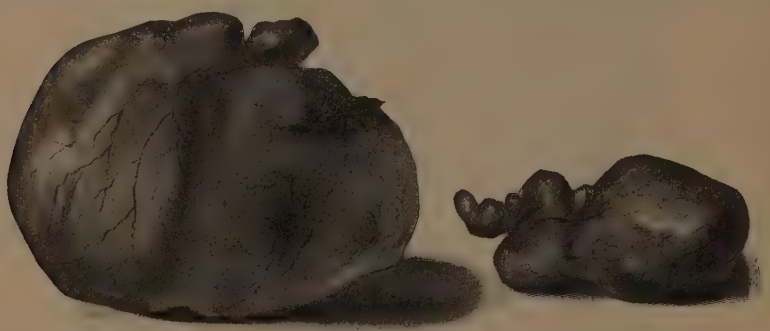


Fig. 509.—Tubo-ovarian Cysts.

fetal ovary. These cysts rarely give rise to symptoms, as menstruation, ovulation, and pregnancy continue.

621. Cysts of the Corpus Luteum.—These are unilocular cysts the size of a pigeon's egg, occasionally as large as an apple. They were first described by Rokitansky, who believed that only the corpus luteum of pregnancy could be thus transformed, but such cysts have been found in nulliparæ. (Fig. 508.) The cyst-wall is comparatively thick, lined by a yellow, apparently folded membrane, in which microscopic examination shows the bud-like papillæ characteristic of the corpus luteum. The recognition of this structure prevents their confusion with follicular cysts, or even with suppurative ovaritis.

622. Tubo-ovarian Cysts.—An ovarian cyst in contact with a distended tube not infrequently results in the formation of a tubo-ovarian cyst. (Fig. 509.) The tubal inflammation early results in the formation of extensive adhesions fixing the

tubal ostium to the ovary. The increasing pressure of the accumulating fluid gradually absorbs the thin septum until the two sacs form one cavity, the smaller portion of which is usually formed by the tube. It does not generally attain a large size. The uterine end of the tube may remain permeable, and, as the fluid increases, permits the excess to drain through the uterus, forming a condition known as profluent tubo-ovarian hydrops. It resembles the condition engendered in hydrosalpinx, known as *hydrops tubæ profluens*. The open tube acts as a safety-valve, preventing the increase and overdistention of the cyst, frequently leading to its complete collapse after every evacuation.

Fig. 510.—Large Ovarian Cyst. Patient Upright.

623. Glandular Proliferating Cyst.—This class of cysts comprises the great majority of ovarian tumors, and they vary from the size of an egg to that of a tumor weighing over two hundred pounds, which may fill up the entire abdomen and encroach upon the thoracic viscera. The surface of the cyst presents a pearly-white, glistening appearance, the thinner portions of which are purple, green, or black, according to the color of their individual contents. The external surface may be smooth, oily, and covered with papillary growths or mucous vegetations. (Figs. 510 and 511.)

The term proliferous is applied to those which are highly organized and abundantly supplied with blood-vessels. The term proligerous is given to cysts that have the faculty of budding

or generating new cysts from or within the original growth. They may be spheric in shape and regular in outline, simulating a single cyst, or may be irregular from the numerous

Fig. 511.—Ovarian Cyst. Patient Recumbent.

nodules, indicating the presence of a multilocular tumor. These growths generally have a distinct pedicle.

624. Pedicle.—The attachment of the tumor may be pedunculated or sessile. The latter are frequently intraligamentary. The pedicle may be long or short, thin and band-like, or broad

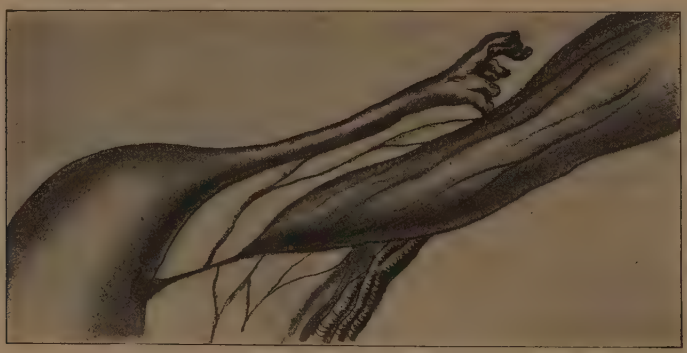


Fig. 512.—Pedicle of an Ovarian Cyst.

and thick. It is developed by the traction of the tumor and the resulting hyperplasia of the ovarian ligament, and by stretching of the meso-ovarium, of the side of the broad ligament, and of the suspensory ligament of the ovary. The tube gener-

ally remains separated by its mesosalpinx from the tumor, though the ampulla is often fastened to or approaches the tumor, because of the strongly drawn infundibular ovarian ligament, and the tube is usually elongated. In ovariotomy the tube is generally removed with the pedicle. After the removal of the tumor the cut surface presents a triangular appearance, in which the angles are pointed or blunt, small or large, and formed by the stump of the ovarian ligament, the transverse section of the tube, and the stump of the spermatic artery. The pedicle consists of smooth muscle-fibers, connective tissue, and hypertrophied blood-vessels.

The pedicle varies in length from four to twenty centimeters;

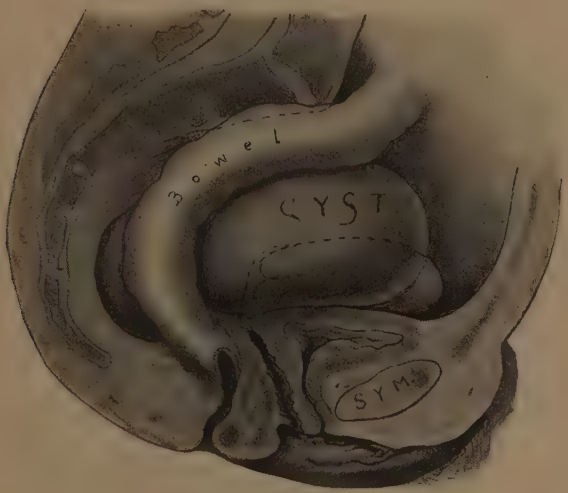


Fig. 513.—Intraligamentary Ovarian Cyst.

in breadth, from two to twelve centimeters; and may be entirely absent. The difference in the development of the pedicle is due, in part, to the insertion of the ovary upon the posterior surface of the broad ligament, and partly to the origin and growth of the tumor.

With the ovary originally embedded in the ligament, the development of the cyst in its external part will result in the formation of a pedicle; but the growth of the cyst toward the hilum may result in the spreading-out of the broad ligament and the formation of a subserous cyst. A cyst growing outward through the ligament may cause it to split and form two pedicles. As a tumor develops inward in an embedded ovary, and spreads out the ligament, the uterus is pushed to one side,

and the tumor fills up the side of the pelvis, to displace the pelvic organs in general. Such a tumor becomes firmly fixed in the pelvis, pushes the peritoneum off from the uterus, invades the space between it and the bladder or rectum, and not infrequently partly spreads out the uterus upon its surface. Such growths are known as intraligamentary cysts. The cyst may be only partly subserous, having spread out the anterior wall of the broad ligament in advance of it, so that the inferior surface of the tumor is uncovered by the serous membrane. The separation of the posterior leaflet in such a growth reveals a long pedicle formed by the anterior fold. As an ovarian tumor develops, its increasing weight carries it

Fig. 514.—Cyst Embedded in the Pelvis.

backward into the retro-uterine pouch. It is very rarely found in front of the uterus. The subsequent development causes it gradually to fill the pelvis until its size no longer permits it to remain below the brim, when it rises into the abdomen. With the change of position there is a partial rotation of the pedicle, which is without clinical significance unless it exceeds a quarter of a circle. Occasionally, the withdrawal from the pelvis is retarded by a marked projection of the promontory of the sacrum, a roomy pelvis, or extensive adhesions. Such a tumor as it increases in size compresses the pelvic viscera, forces the uterus and bladder upward, and may dissect downward until it protrudes at the vagina, as in a case under my

observation, which was covered only by the posterior vaginal wall.

The nonpedunculated tumor, as it progresses, becomes limited by the lateral walls of the pelvis, after it has spread out the structure and come in contact with the parametrium. In its further growth it is pushed upward and to the opposite side, carrying the uterus. These changes frequently displace the sigmoid portion of the colon, placing it above and in front of the tumor. The intestine is frequently compressed, but not sufficiently to close its canal, and the large vessels are often obstructed.

The presence or absence of the pedicle depends somewhat

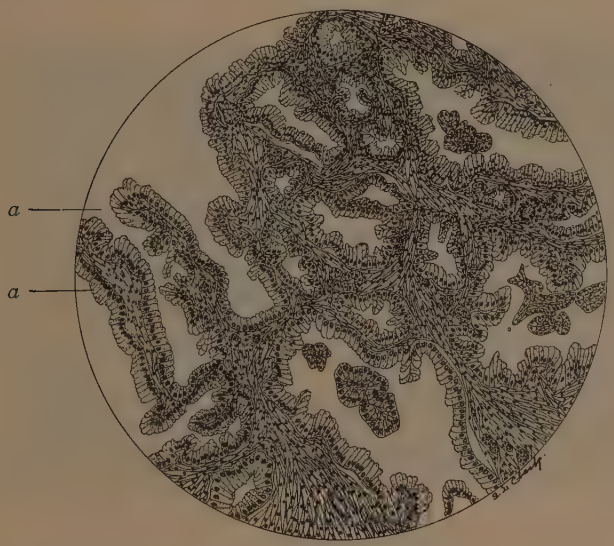


Fig. 515.—Adenocystoma of Ovary, showing Papillary Formation.
a. Papillary projections.

upon the variety of the cyst. The glandular incline to a long pedicle, the papillary to a short or absent pedicle, and the dermoid to a short, strong pedicle.

625. Structure.—The consideration of the internal structure of the glandular cysts justifies their division into areolar, unilocular, and multilocular. These glandular cysts, according to Virchow, originate in an invagination of the proliferating ovarian epithelium into the stroma. Further invagination and proliferation of the tissue result in the formation of new gland tubes, from which new cysts form. (Fig. 515.) The continuation of these processes results in the formation of the

many-chambered glandular or adenomatous cyst. Mary A. Dixon-Jones attributes ovarian growths to inflammation through which the tissues become embryonal and new growths follow.

Areolar Cyst.—A conglomeration of small cysts with a thick, well-developed, and vascular stroma is known as an areolar ovarian cyst. A number of these cysts may have ruptured to form a considerable sized one, or the tumor may consist of a very large number of small masses, none of which will exceed the size of a plum. (Fig. 516.)

Unilocular cysts often attain an enormous size, but examination discloses evidences of their previous division into numerous smaller cysts, so that we can safely assert that all unilocular cysts have originated from the multilocular. The investigation

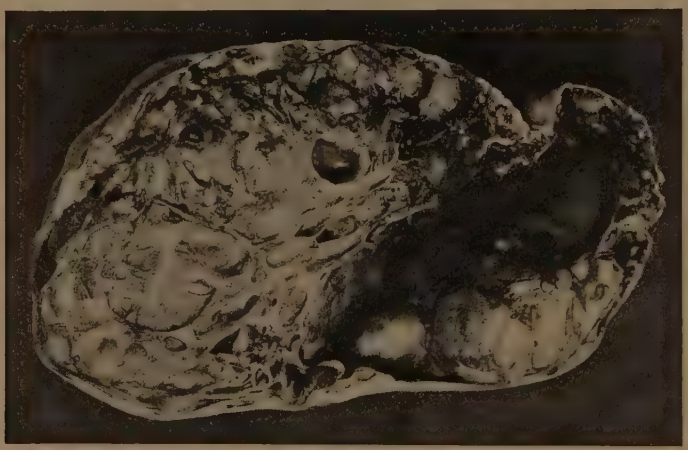


Fig. 516.—Areolar Ovarian Cyst.

of a large cyst will usually show the presence of small cysts in its walls, and not infrequently the remains of septa within its cavity.

Multilocular cysts contain a number of cysts of varying size, so arranged as to present the appearance of a single tumor. As these individual sacs increase, their intervening walls become gradually thinned, until, one after another, they rupture and the sacs coalesce to form larger single chambers. Not infrequently the circumference of the septa remains, to become still more stretched as the tumor grows, until it forms a cord-like thickening upon the inner surface. Occasionally, the vascular structure alone remains to indicate the former septum. In sudden rupture the vessels of the septa are torn,

producing extensive hemorrhage into the sac, which changes the character of the cyst-contents.

In the principal cyst we usually find a wall of three layers, the outside consisting of pure connective tissue, like the albuginea of the ovary. The middle layer consists of loose connective tissue with numerous large vessels, while the inner layer is rich with cells and contains numerous small vessels.

The external surface of the cyst is covered with columnar epithelium, which differs from the pavement epithelium of the peritoneum. The cysts are lined with a one-layered cylindric epithelium, which presents different forms in different tumors, and by its structure governs the character of the secretion in

Fig. 517.—Unilocular Cyst.

the various sacs. It is only in the smaller sacs, however, that the true similarity of the epithelium and secretion is observed. In the larger cysts the epithelium undergoes degenerative changes; is flattened by pressure; suffers disturbances of nutrition through thinning of the septal wall; and undergoes fatty or albuminous changes, which cause the epithelium entirely to disappear from the wall of the larger cysts. Epithelial sprouts may remain upon the wall, forming new growths.

Pfannenstiel directs attention to the possibility of the formation of papillary growths in the adenomatous cysts. This formation is of great variety, and is found inside as well as upon the surface of the tumor. Sometimes these growths are but

sparsely distributed upon the inner surface of a large cyst; in others they appear as circumscribed tufts upon one side, while the remaining portion is smooth; or, again, the entire cavity may be filled with strong, branching growths, while the quantity of fluid is very scanty. The larger the cyst, the greater the probability that a large portion of the wall is smooth. As a rule, the papillæ are most marked upon the side of the cyst toward the hilum, while the peripheral side will be scantily, if at all, involved.

A great variety in the quality of these vegetations exists; at times only small wart-like growths, from one to two millimeters high, are scattered over the surface, together giving a velvety or grater-like appearance; at others, branching growths of various sizes, up to that of an apple, which may be either broad-based or with a thin pedicle. All the changes are present that are found in the ordinary papillary cyst. The growths appear either as reddish, granulating, cauliflower-like projections, or as sago-sized masses; rarely in the grape-cluster form.

Fig. 518.—Multilocular Cyst.

Cyst-contents often present very great contrasts in their color and consistency; they may be found almost colorless, straw-colored, green, purple, or black in color; thin or thick; viscid or gelatinous in consistency. The contents of the various cysts in the same tumor will differ in color and consistency. In some the fluid will be thin, and in others so viscid that it will not flow. The fluid in the smaller cysts is more consistent, and becomes thinner as the cysts increase in size, because of changes in the epithelium.

The special gravity of the fluid varies from 1002 to 1020, with an average of about 1012. However viscid the fluid, it is found absolutely structureless. Blood-corpuscles, epithelial cells, and crystals of cholesterin are often present. The reaction of the fluid is neutral or alkaline. Upon analysis various forms of albumin, as the metalbumin, paralbumin, and albumin-peptone, are found.

626. Papillary Proliferous Cysts.—The papillary cysts show a marked proliferation of the connective tissue, which forms itself in tufts upon the inner surface of the tumor, as described in the complication of the glandular growths above. These branching projections may distend the sac to bursting, and these tufts project upon the outside, leading to rapid infection of the general peritoneum. The vegetations spring up luxuriantly over the surface of the ovary, are carried to every part of the peritoneal cavity, and not infrequently, by the action of the diaphragm, are carried to the upper surface of that muscle into the thorax.

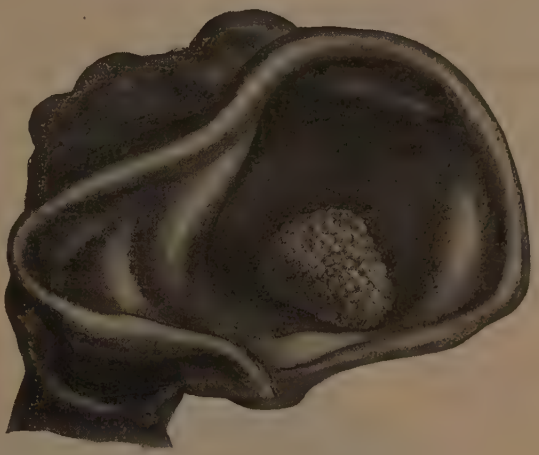


Fig. 519.—Small Papillary Ovarian Cyst.

The contact of this infection with the peritoneum rapidly produces ascites. Similar vegetations may arise spontaneously from the surface of the ovary, and are then known as superficial papillomata. It is probable that these are cases in which a very small cyst has opened and afforded the seed which has infected the external surface. The papillary tumors rarely attain a large size, and are generally bilateral. The dendritic growths project in every direction, are reddish, or pearly white and glistening, often three or four inches long, and have the appearance of stems of coral. The

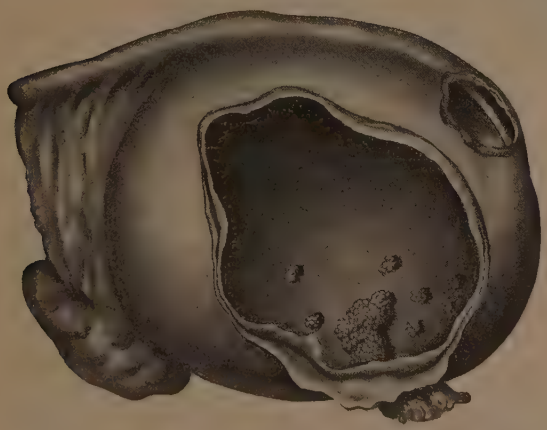


Fig. 520.—Papillary Tufts upon Inner Wall of Cyst.

masses have usually undergone a partial calcification, so that they break easily and without bleeding.

627. Dermoid Cysts.—These are growths in which are found skin and mucous membrane, together with all the structures generally associated with such tissues. The tissues most frequently found are hair, teeth, nails, and sebaceous and sweat glands. Other structures, occasionally seen, are the mammæ, horn, bone, unstriped muscle-fiber, and, rarely, tissue resembling brain. Fat or sebaceous material exists in the largest quantity, often at the temperature of the body in a liquid state. Occasionally, it is found in solid balls. Sutton reports finding over three hundred of these in one sac. Hair is frequently present in great abundance, and varies in color, length, and quantity. The hair may be blond, brown, or black, but bears no relation to that of the

Fig. 521.—Surfaces of Ovaries Infected with Papillary Vegetations.

individual. Teeth are found in about one-half the cysts; they may be loose, fixed, or buried in the wall. Section through the tooth often reveals it situated in a bony alveolus. Beneath the hard crust of the tooth is found a white or reddish-yellow medullary substance.

We may occasionally find incisors, molars, and premolars in the same bone. The number of teeth is often enormous. Schnabel described a case which had three pieces of bone and one hundred teeth. Plouquet found three hundred teeth. Various bones have been described, as, the jaw-bone, the petrous portion of the temporal bone, ribs, and the pelvic bones. A finger with articulated phalanges, nail, and nail fold, and an entire skeleton have been recognized. In a double dermoid removed from a girl

of eleven years I found a well-formed half of the upper jaw, equipped with teeth, alveolar process, and normal mucous membrane.

Dermoids do not always occur alone, but in conjunction with large glandular cysts, the dermoid forming but a small part of the mass. Sometimes the entire cyst will be found filled with sebaceous material, while careful examination, after washing, shows that the skin covers only a small part of the mass.

Teratoma is a more complex form of tumor which is usually classed with the dermoid. It contains an even more varied structure, and resembles more the solid growths than the cystic. It often attains an enormous size, and contains the various structures of the dermoid and cartilage and a large amount of

Fig. 522.—Dermoid Ovarian Cyst.

connective tissue. Dermoid growths may appear at any age. They have been found in children at birth and in women of ninety years.

The contents of a dermoid are exceedingly irritating, and every precaution should be practised to prevent the peritoneal cavity from being soiled. I saw a patient in whom an attempted aspiration resulted in drawing out a wisp of hair; the patient at once developed peritonitis, which an early operation failed to prevent becoming fatal.

628. Parovarian Cysts.—The parovarium is situated in the lateral part of the mesosalpinx, and is the remains of the sexual part of the Wolffian body. It resembles in its arrangement a

comb, the back of which is directed toward the tube, while the teeth, some twelve to fifteen in number, converge toward the ovary. They are lined with large cylinder epithelium and terminate in blind extremities. The tumors which originate from this structure are almost always cystic and subserous, and consequently have a double wall. The external peritoneal one is easily separable. The pedicle consists of the tube and of the median ovarian and the suspensory ligaments. Torsion of the pedicle, when long, can easily occur. There are two kinds of cysts which arise from the parovarium, of which the most frequent are the small pedunculated, connected with Kobelt's tubules, which rarely become larger than a pea, and are of no clinical significance. The more important are the sessile, which remain between the folds of the broad ligament and burrow into it as they enlarge. These cysts are usually small, though Kummel describes one that weighed forty-two pounds. In the large cysts the tube becomes elongated. The contents of the cyst are clear and limpid, with a specific gravity of 1010 and an alkaline reaction.

The parovarian and broad ligament cysts form about eleven per cent. of the abdominal tumors of pelvic origin, and both proliferating and dermoid growths have been found in this situation.

These cysts are distinguished from the ovarian, first, by the ease with which the peritoneum can be stripped off; second, by the ovary being generally found attached to the side of the cyst; third, by the cyst being unilocular; fourth, by the Fallopian tube stretched over the cyst and never communicating with it; and, lastly, by the gradual thickening of the mesosalpinx.

629. Solid Ovarian Tumors.—The solid growths of the ovary comprise five per cent. of the cases that present themselves for operation. These tumors are innocent and malignant, and may become cystic.

630. Fibromyoma, the benign form, is a rare tumor, but is the most common species of solid ovarian tumor. It closely resembles the uterine fibroma, and is frequently accompanied by ascites. Its growth is slow, and the mass retains the normal shape of the ovary. Adhesions are rare; indeed, owing to the peritoneal fluid, the mobility is increased. Occasionally, we have a growth—the fibroma—in which the minute structure consists of wavy bundles of closely packed fibrous tissue intermixed with small round cells. Williams describes one of these that weighed seven pounds seven ounces; Doran, one of seventeen pounds. The myomatous variety is more frequent, and occasionally undergoes calcareous degeneration, when it may be mistaken for an osseous tumor.

An apparent hypertrophy, instead of atrophy, of the corpus luteum results in the formation of a growth, occasionally reac ing the size of a walnut, which Dr. Mary D. Jones pronounces a *gyroma*, and believes to be closely connected with the endothelium. It probably develops from the corpus luteum when in the cortex, and from the endothelium in the medulla. Leopold describes a peculiar form of ovarian fibroma containing alveolar spaces packed with epithelioid cells. They are produced by

Fig. 523.—Fibromyoma of Ovary.

Fig. 524.—Sarcoma of the Ovary.

dilatation of the lymphatic and capillary channels and the proliferation of their endothelium.

631. Sarcoma of the Ovary.—Sarcoma resembles in form, size, and color the fibroid, excepting that its surface is smoother. Its consistence is softer than the fibroid, though it contains much fibrous tissue, which renders the diagnosis at times difficult to determine. Sarcomata occur as round-cell and spindle-cell growths;

when the latter predominate, the tumor is more solid and more strongly resembles the fibroma. The muscle-fibers are longer and the nuclei are more slender and rod-like. The round-cell structure is softer, often presenting macroscopically medullary properties similar to those of medullary cancer, and under the microscope are found large layers and nests of round cells, united with irritation cells, and penetrated by numerous blood-vessels of every caliber.

Spindle and round cells are frequently combined, while myxomatous transformation exists in both kinds, but cartilage and bone formation rarely occurs.

Combinations of sarcoma with adenoma are observed in the walls of the larger cysts, sometimes with sarcomatous degeneration of the stroma. In places, large alveoli are separated by vascular connective tissue, which contains large cells undergoing fatty degeneration and resembling carcinoma. This condition Spiegelberg has called sarcoma carcinomatosum.

632. Carcinoma of the ovary is a much more frequent condition than sarcoma. The medullary variety is the most common, and may form a tumor as large as a man's head. The disease occurs primarily, but much more frequently as a secondary manifestation.

633. Endothelioma of the Ovary.—A growth is occasionally found in the ovary which originates from the endothelium of the lymph-spaces or blood-vessels of the organ. It has been previously classed by pathologists with both sarcoma and carcinoma, resembling the sarcoma from its frequent metastasis through the blood-vessels, a carcinoma in consisting of nests of cells with a fine stroma. The growth rarely attains a great size, not larger than an orange or fist, forms a solid tumor, and is a rather firm whitish growth. This same structure not infrequently is found complicating the glandular proliferating cysts, and gives evidence that many of these tumors, if carefully investigated, would show the presence of malignant conditions.

634. Etiology.—Very little is yet known as to the general cause of ovarian tumors. Three theories for their origin have been presented: (1) The Cohnheim theory, which attributed their growth to the retention of embryonic products; (2) the theory advanced by Mary A. Dixon-Jones, that they were always the result of previous cases of inflammation, and that the inflammatory condition of the ovaries gave rise to embryonal tissue from which the growth subsequently developed; and (3) the theory of parthenogenesis, or the development of the non-fecundated ovum as the result of some irritation. The first and second theories are those which have the greatest number of advocates at the present day. According to the first, der-

moids are derived from the infolding of the ectoderm in embryonic life, and these cells during subsequent irritation take on active growth and result in the formation of the various tissues found in a dermoid growth. It is claimed, however, by the advocates of the theory of parthenogenesis that there are some structures found in the dermoid ovary which would require the infolding of all of the layers of the blastoderm in order to complete their development. The advocates of the first theory, however, direct attention to the fact that striated muscle is never found in the dermoid cysts. The character of irritation which sets in motion the development of these growths, whether mechanical or chemic, animate or inanimate, or whether it differs in the various kinds of tumors, is as yet unknown. The frequent occurrence in a cystadenoma of double-sided growth from the covering epithelium favors the belief in a chemic irritation which has proceeded by the way of the uterus and tubes. The theory of the parasitic origin of tumors is as yet unproved, though the analogous course of tumor disease with infection has demonstrated that the development of various kinds of tumors in the different tissues of the body from metastatic deposits is of great interest.

The susceptibility to the influence of tumor exciters greatly varies in different individuals; heredity, acquired disposition, age, trauma, scar formation, and inflammation are important factors. Of the influence of heredity little is known, though the occurrence of ovarian cysts in several women of one family is quite frequent. The age has no especial significance as they occur in every period of life. The glandular cysts are more frequent between the thirtieth and fiftieth years. All varieties are less frequent in childhood and old age. Fetal tumors are rare, and generally consist of simple follicular cysts. These cysts increase in frequency as the child approaches puberty, probably then induced by the congestive hyperemia.

Ovarian growths are more frequent in the single than in the married. Scanzoni indicates chlorosis as a predisposing factor, and Fenwick, tuberculosis; but these are difficult to demonstrate.

635. Natural Progress.—Proliferating cysts in the advanced stages grow more rapidly than either the dermoid or solid tumors, unless the latter are malignant. About the early stage of ovarian tumors but little is known, as they are usually well advanced before they come under the observation of the physician. The growth is probably slow. In dermoids and in benign solid tumors the growth throughout is slow. A rapid increase in the size of a growth, noticeable from day to day, is a symptom due to hemorrhage. With the pelvic structures in a normal condition, the cystic ovary drops by its weight into Douglas' pouch, a little to one side of the median line. As it increases it advances in the

direction of least resistance, which is upward, and pushes the intestines before it, until it rises out of the pelvis and impinges against the abdominal wall, when it assumes a central position. The pedicle, at first anterior and inferior, is now directly beneath, and often becomes posterior. The tumor lies directly above the uterus, and, resting upon the brim of the pelvis, causes but little inconvenience. Occasionally, the tumor becomes impacted in the pelvis through irregularities in its growth or the formation of extensive adhesions. Sometimes the tumor pushes the broad ligament before it, or, when it develops in the hilum, it will spread out the ligament and become an intraligamentary growth. Once the growth rests upon the pelvis, in its further advance it pushes the intestines upward and laterally. If undisturbed, the enlargement becomes very great, the diaphragm is pushed upward, severe pressure symptoms follow, and the action of the heart and lungs is obstructed. The limbs appear as mere appendages to the enormous abdomen. The pressure affects the circulation, respiration, and digestion, and the renal secretion. There is marked suffering, emaciation, and the characteristic facial expression known as facies ovariana. The presence of ovarian tumors does not interfere with ovulation and menstruation, even though both ovaries are involved, as long as any portion of the ovarian stroma is destroyed. Thornton reports a case of pregnancy with bilateral dermoid disease. In solid tumors amenorrhea is due to the total destruction of the Graafian follicles.

636. Symptoms.—In their early stages ovarian tumors rarely produce any symptoms. Movable tumors generally come first to observation when they rise out of the pelvis. An apple-sized tumor will occasionally, though movable, cause unpleasant symptoms, such as pain in the sacrum, which extends down the leg.

Intraligamentary tumors or those prevented by adhesions from rising produce symptoms as soon as they fill the pelvis, especially by obstruction to defecation and micturition. As the tumor increases, the sensations of pressure and unpleasantness are aggravated. Besides the effects given in the description of the progress, the skin becomes stretched, forms striæ, and swelling of the navel and hernia occur. More rarely, from the pressure upon the great vessels, there are edema and varicosities in the legs, sexual apparatus, and skin of the abdomen.

Albuminuria is present, and diminution of the urine from compression of the renal veins is observed, which disappears with the removal of the pressure. Severe compression symptoms from the presence of very large tumors are now rarely seen.

Uterine or vaginal prolapse sometimes complicates the condition, but more frequently ascites and fluid collections follow the rupture of a cyst.

Menstruation is usually unaffected, and sometimes continues regular when subsequent microscopic investigation has failed to show any functionally capable structure. Menstruation disappears comparatively early in those cases in which the follicles perish from the development of sarcoma or carcinoma, and in the papillary cystadenoma, when bilateral. In contrast to fibroid tumor, the menstruation decreases, and a disposition to the menopause is betrayed, not from absent ovulation, but as the result of constitutional conditions. Amenorrhea may exist for several years and menstruation may return after the removal of an ovarian cyst. In intraligamentary growths, especially the papillary cystadenoma, severe menorrhagia occurs from pressure upon the uterine veins.

637. Complications.—Ascites occurs infrequently with cystic growths, unless from rupture, but is very frequent in the solid tumors. The cause is unknown. It can arise from pressure upon the venæ cavæ and large abdominal veins. Edema may involve one or both legs. Distention occurs in the ureter and pelvis of the kidney. The most frequent complication is the formation of adhesions between the surface of the tumor and the omentum, the intestines, the uterus, the bladder, and the abdominal wall. These adhesions arise from inflammation, peritonitis, and sometimes painlessly. They possibly arise from the loss of surface epithelium of the cyst, through friction; fibrinous exudation results, and the formation of adhesions between adjacent surfaces. The adhesions become firm, dense, often thread-like, and between the omentum and the growth may convey vessels of sufficient size to be an important factor in the blood-supply. Dermoids are frequently complicated by adhesions. When adhesions occur between the tumor and the bladder or the intestine, the cyst may open into either, and thus discharge its contents. A lock of hair may project from a dermoid into the rectum or the bladder. Adhesions are of importance from the increased difficulty in the removal of the growth. It is frequently exceedingly difficult to distinguish the cyst-wall from the parietal peritoneum.

Torsion of the Pedicle.—A moderate twisting of the pedicle to 90 degrees produces no symptoms; it is only when the torsion is sufficient to influence the circulation, or above 180 degrees, that disturbance is occasioned. A slight twisting always occurs with the elevation of the cyst from the pelvis. The right-sided tumor turns to the left, and the left-sided to the right. The cause of the torsion is unknown. Küstner ascribed it to peristalsis and the changes from the distention of the rectum; Cario, to sudden belly pressure; Mickwitz, to contraction of the transversalis muscle. The influence of pregnancy and changes of position in a relaxed

abdomen which contains a tumor with a long pedicle are factors. This torsion may readily arise from manipulation to determine the diagnosis. I saw it occur in a young girl who had been thrown upon the floor by her companion, who sat upon her abdomen. The torsion can occur with very small tumors which are still within the pelvis, in which it most probably arises from the

Fig. 525.—Torsion of the Pedicle.

varying distention of the bladder and rectum. The twist may involve but one or two turns of the pedicle, though as many as six twists have been observed. The tube usually shares in the twisting, and torsion of the uterus has infrequently occurred. Torsion of the pedicle can take place in any variety of tumor, though from its greater frequency it is found most often in the

cystadenoma. Dermoids and parovarian growths also show a marked tendency to undergo pedicle-torsion. The tendency to torsion of the pedicle is favored by the existence of a long, membranous pedicle, a spheric form of the tumor, and a smooth surface. The twisting is still further favored by pregnancy, labor, and child-bed, through the changing relations of the organs in the abdominal cavity.

The results of the torsion are dependent upon the rapidity with which it has occurred. The torsion causes obstruction of the vessels, in which the thin-walled veins suffer before the more resistant arteries. There necessarily results an increased engorgement of the blood in the tumor. Solid tumors are completely penetrated by blood, and cystic growths undergo hemorrhagic infiltration of the walls as well as of the contents. The surface presents a black, blue, or dirty brown color, the cyst rapidly increases in volume, and, as a result, easily breaks down. A fatal result can occur from hemorrhage into the abdominal cavity. More frequently hemorrhage is arrested, but the nutrition of the tumor suffers. The covering epithelium is lost, and extensive adhesions occur between the surface of the tumor and the surrounding structures, as the omentum, intestines, and parietal peritoneum.

These adhesions are, at first, very loose, then become organized, and the growth thereby obtains a new source of nutrition, by which it maintains its size or proceeds to new growth. Further twisting leads to obstruction of the arteries, which is followed by necrosis of the growth. Necrosis is followed by shrinking of the tumor from the absorption of its fatty constituents, though it rarely disappears. It can become calcified. Peritonitis, with the formation of extensive ascites, almost always results. The peritonitis arises independent of micro-organisms, and is due to the irritation from the presence of a foreign body or to the chemic products of the tumor. An infection can occur through the tube or from kinking of the intestine. Sometimes suppuration of the tumor and pyemia ensue. A slight torsion can bring about edema instead of hemorrhage, and ascites instead of peritonitis. The pedicle may be found attenuated or its thickness may be doubled. The dermoid growths are sometimes found free in the abdominal cavity or in pedicle-like adhesion with other structures. A dermoid under my observation was held in front of the uterus by adhesions above to the omentum, and below to the peritoneum; the tube and upper part of the broad ligament upon the left side had entirely disappeared. The separation was evidently old, for the wall of the growth had undergone calcareous degeneration. Ileus has resulted from the adhesion of a loop of intestine to the tumor or to its pedicle.

Symptoms.—Not infrequently there are no symptoms of torsion. Such cases are usually recent or the torsion has been slight. It may be suspected when the patient is taken with severe pain in the belly, associated with meteorism, and sensibility to pressure, acceleration of the pulse, sometimes also singultus, vomiting, and fever. In torsion of high degree indications of intra-abdominal bleeding appear, with not infrequently marked collapse. In the chronic condition the pain and unfavorable symptoms are more gradual, though many patients are bedridden and show a distinct loss of strength, occasioned by the absorption of the altered constituents of the tumors producing a condition resembling cachexia.

Inflammation and Suppuration of the Cyst.—Cysts can undergo inflammatory and suppurative changes, though much less frequently than formerly, as puncture of the cyst is not so often practised. In some tumors, the contents of which resemble pus, the microscope demonstrates that the material consists of epithelium and cell detritus, but not of leukocytes. The inflammation is mostly communicated by the tube and intestine; the latter especially when adhesions have taken place between the intestine and the sac. The opportunities for infection are increased by parturition and the puerperium, as a result of the possible trauma occasioned during the labor. Dermoid tumors are inclined to suppuration, formerly supposed to be due to the peculiar pus-exciting character of their contents, but much more probably the result of injury which the tumor has undergone during its long retention within the body. We have already seen that the dermoid was prone to torsion of its pedicle, and its contents are an excellent culture-medium for the propagation of bacteria.

Fig. 526.—Dermoid Which Had Lost Its Original Relations and Was Nourished by Adhesions from the Omentum.

Symptoms.—The occurrence of inflammation and suppuration

is characterized by fever and typhoid phenomena, which vary in intensity according to the nature of the infection. The patient does not experience much pain unless peritonitis is associated. The pulse becomes very rapid and emaciation is progressive. Adhesions to the suppurating tumor occur, and the pus makes its exit, as in ovarian abscess, into the bladder, the rectum, or the vagina. It is but rarely that the pus is completely evacuated and that spontaneous recovery results. Death usually follows from pyemia. A rupture into the peritoneal cavity is quickly followed by fatal peritonitis. The evacuation of such a tumor through the bladder produces the greatest distress, as hair, teeth, and pieces of bone are discharged, sloughs become impacted in the urethra and induce cystitis, and there is retention of urine and marked vesical tenesmus. Fragments which remain in the bladder are coated over with urine salts, and become the nuclei of calculi.

Rupture of Cystic Tumors.—Rupture of a cyst may occur suddenly, the result of a fall or blow, or can gradually result from changes in the cyst-wall. It occasionally follows from internal pressure caused by the growth of the tumor. The latter accident produces no symptoms, and it is only exceptionally that hemorrhage complicates spontaneous rupture. In papillary growths the pressure of the vegetations causes thinning of the cyst wall, and, finally, rupture; or the growths project through the wall of the cyst, to extend over its external surface. Rupture of a cyst can occur into the surrounding viscera, but more frequently into the peritoneal cavity. In very thin-walled cysts this rupture occurs easily. Manipulation to determine the diagnosis, changing the position in bed, the act of coition, vomiting, may produce it, and frequently it occurs without assignable cause. The influence of the accident will naturally depend upon the character of the cyst-contents. Often, in the unilocular cysts, rupture into the peritoneal cavity is attended with no untoward symptoms, beyond an excessive flow of pale urine. The patient will often pass several gallons of urine in twenty-four hours, and the abdomen, which was large, will become flattened, flabby, and readily permit the residual sac to be recognized by palpation. In single and parovarian cysts recovery can occasionally follow the rupture. Generally, the opening is closed by adhesions, and the fluid reaccumulates. In some cases the accident is followed by high temperature, rapid pulse, vomiting, pressure at stool, and diarrhea, which indicate the absorption of the contents, and by a kind of auto-intoxication. In multilocular and dermoid growths the rupture into the peritoneal cavity is ordinarily followed by infection, a rapidly developing peritonitis, and, finally, death. Such a termination is probable not only in dermoid, but also in those

cysts containing colloid material and pus. In the papillary cysts rupture results in the infection of the peritoneum, the formation of ascites, and the development of vegetations over the entire cavity. Sometimes an artery is torn in the rupture, and marked hemorrhage, with profound anemia, follows. Profound collapse has been noted.

The occurrence of rupture is recognized by the disappearance of, or diminution in the size of, the tumor, the recognition of free fluid in the peritoneal cavity, peritonitis, collapse, diarrhea, and diuresis. The accident can be mistaken for torsion. Rupture into the intestine is evident from the character of the discharges; when a profuse watery discharge escapes from the bowel rupture into the intestinal canal is suspected. External rupture is usually easily recognized. When the discharge is pus or ichorous material alone, it is often difficult to determine whether it is from a cyst or an abscess in the walls.

Complication of Ovarian Tumor with Pregnancy.—The existence of ovarian growths does not preclude the occurrence of pregnancy, though their coexistence is comparatively rare. It is more frequent in the one-sided, though it occurs sufficiently often in double-sided disease to demonstrate its possibility as long as any functionating portion of ovary remains. The complication can occur with any variety of ovarian tumor, though it is more likely to complicate the slow-growing forms—the dermoid and the pseudomucin—than the others. Numerous cases are recorded in which the patient carrying an ovarian tumor has successfully run the gauntlet of several pregnancies. The existence of such a tumor, however, does increase the distressing symptoms and the danger of pregnancy. There is not the same tendency to rapid growth of the cyst during pregnancy as exists when a fibroid growth is complicated by the same condition. The assertion that the occurrence of pregnancy favors malignant degeneration in the cyst is unproved. The occurrence of carcinoma in a cyst during pregnancy is no proof that it was not previously there, or that it would not have occurred had pregnancy never existed. The changing relations of pregnancy, labor, and childbed undoubtedly do favor the occurrence of torsion of the pedicle, and the delivery of the fetus, whether naturally or by the use of instruments, not infrequently crushes or bruises the cyst so that it ruptures or undergoes inflammation and suppuration. While the varying relations of pregnancy, labor, and the puerperium exert an injurious influence upon the progress of the tumor, it can, on the contrary, greatly disturb these processes. The diminished space in the abdomen affords less room for the normal development and increases the danger of abortion and premature delivery. Abortion has been frequently reported as a

result of the retroflexion of the uterus produced by the tumor. In labor a large tumor can materially interfere with the normal forces of delivery by decreasing the activity of the contractions and by altering the situation of the uterus. Much more worthy of consideration is the situation of a tumor of small size in the pelvis, below the uterus, where it acts as an obstruction to the progress of the child's head. If these are not flattened or pulled out of the pelvis, the head of the child can not enter, and, unless otherwise alleviated, labor may terminate in rupture of the uterus, tearing of the vagina, or bursting of the cyst. Such complications are necessarily attended with danger. The puerperium can be complicated by gangrenous processes in the tumor and its pedicle, following the injury of labor.

Fig. 527.—An Ovarian Cyst beneath a Pregnant Uterus.

The coexistence of the ovarian tumor with pregnancy, when large, causes increased difficulty in respiration, through pressure upon the diaphragm, and can cause danger to life by the pressure and the tendency to albuminuria and edema. The tendency to torsion of the pedicle, to rupture of the sac, and to subsequent inflammation naturally clouds the prognosis.

When the cyst is situated in advance of the uterus, an effort should be made to push it up, and, upon failure, we may be left to the choice between delivery of the growth through a vaginal incision or its puncture through that canal and its removal after delivery. In the early months of the pregnancy operative interference for the removal of the tumor has but little influence upon the progress of the pregnancy, and should be considered when-

ever the size and situation of the growth threaten the successful termination of the pregnancy.

638. Degenerative Changes in the Cyst-walls.—The cyst-walls can undergo the following degenerative processes:

First, *calcification*, which most frequently occurs in the inner layer of the main cyst-wall in the form of small granules or plates of lime, or the formation of psammous bodies similar to those seen in the papillary cysts. The calcification is increased with the impairment of nutrition following gradual torsion. In a case of dermoid which came under my observation the deposit was so extensive that the tumor resembled a calcareous fibroid.

Second, *fatty degeneration* occurs in the papillary cells and in the connective tissue of walls of the cyst. This process is enhanced by impairment of nutrition. The change in the septa of cysts occurs from the pressure of their contents, and ends in their partial or complete destruction. The presence of a large amount of fat in the walls is an evidence of slow growth.

Third, *atheromatous changes*, which generally occur in the inner layer of the wall.

Fourth, *changes due to infarctions*, which are indicated by whitish, opaque bodies found in the septa and surrounded by a red zone.

639. Diagnosis.—In the diagnosis of ovarian tumors the physical signs are ascertained by the employment of inspection, palpation, percussion, and auscultation. The information derived by these procedures has been given. (Sections 97 to 101.) The difficulty in the diagnosis will depend upon the size, situation, relation, and complications of the tumor.

The questions to be considered are: (1) Is the abdominal enlargement under observation a tumor? (2) The existence of a tumor recognized, is it an ovarian growth? (3) An ovarian tumor admitted, its relations to the surrounding parts and the existence or absence of a pedicle or of adhesions remain to be determined. (4) The variety of the ovarian tumor.

First, Is the distention of the abdomen an intra-abdominal tumor? This, at first thought, may seem an unnecessary question, but the frequency with which various enlargements of the abdomen are mistaken for such growths, and the occasional difficulty in arriving at a certain determination, fully justify the careful consideration of the subject. For convenience of study we divide the ovarian growths into small, or those situated within the pelvis, and large, when they are resting upon the pelvic brim.

The abdominal enlargements, other than tumors, with which an ovarian tumor can be confused are obesity, desmoid tumor of the abdominal walls, ventral hernia, tympanites, fecal accumulation, distended bladder, ascites, and localized peritoneal effusion.

Obesity.—A large, pendulous abdomen, from the accumulation of fat within its walls or in the omentum, is sometimes mistaken for an ovarian tumor. The history of its development and the distribution of adipose tissue to other parts of the body, contrasted with the general emaciation of an ovarian cyst, should assist in determining the diagnosis. The thickness of the fat accumulation can be pretty accurately estimated by grasping a fold of the skin and subcutaneous tissue between the thumb and fingers.

Desmoid Tumor of the Abdominal Walls.—This growth, which is infrequent, develops in the muscle-wall, and partakes of the nature of a fibroid. Generally, from its weight it forms a dependent tumor, which sometimes extends to the knees. It is quite movable with the abdominal wall, and is superficial and very hard. Its situation in the wall, covered by the skin and superficial fascia, and the determination by vaginal or rectal examination of the absence of any connection with the pelvic viscera, determine its character.

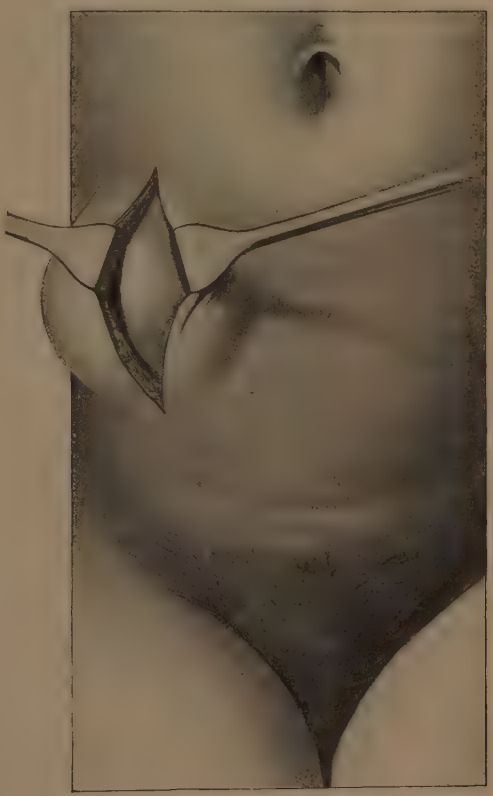


Fig. 528.—Desmoid Tumor of Abdominal Wall.

Ventral Hernia.—Twice in diastasis of the recti muscles with a large protrusion of the viscera have I been called a long distance to operate for supposed ovarian cyst. Palpation of the intestinal coils, the resonance upon percussion, and the observation of the peristalsis, readily seen through the thin covering of skin and peritoneum, should have excluded the diagnosis of a cyst.

Tympanites.—A localized tympanites or phantom tumor, a condition similar to pseudocyesis, is sometimes mistaken for an ovarian cyst. The loud volume of resonance obtained by per-

cussion should be considered as contraindicating the probability of the existence of a cyst. It is true that in rare instances a communication of a cyst with the bowel will permit it to become resonant. A similar condition will arise from decomposition of cyst-contents, by which gas forms in the cavity. Even in these cases a sense of fluctuation can be secured, which is absent in the phantom tumor. The latter tumor will entirely disappear while the patient is under an anesthetic, to return as soon as the patient recovers.

Fecal Accumulation.—An accumulation of feces is sometimes called a fecal tumor. It forms in the colon, and when in the transverse portion of the gut, may descend and lie directly over the pelvis. These accumulations are occasionally quite extensive, but are recognizable by their length, by the peculiar sensation under palpation, and by the possibility of leaving an imprint upon pressure, but most of all by the fact that they disappear under the administration of purgatives and enemata.

Distended Bladder.—A distended bladder forms a tumor in the lower part of the abdomen which fluctuates and may very readily be mistaken for an ovarian cyst. This suspicion is apparently confirmed by the information that the patient is constantly passing urine. The fixed position, and the bulging of the anterior wall of the vagina, should be sufficient to indicate the use of a catheter, when the tumor will disappear. It should be the invariable rule to empty the bowel and bladder preliminary to the examination of an abdominal tumor.

In pregnancy, fibroid tumor, or even a simple ovarian tumor impacted in the pelvis, the urethra may be so distorted and compressed as to render necessary the use of a soft male catheter.

Ascites.—In uncomplicated ovarian cysts the differential diagnosis from ascites is not difficult to make. The cysts have, in common with ascites, enlargement of the abdomen, fluctuation, and the symptoms arising from pressure against the diaphragm. Not infrequently both conditions will be characterized by progressive loss of strength and flesh and by more or less edema of other parts of the body, but there is a marked difference in the manifestation of these symptoms when we come to analyze them. The enlarged abdomen in ascites is more or less flattened and its widest diameter is transverse, while the ovarian cyst is most prominent in the vertical diameter and is narrow from side to side. Fluctuation is very distinct over the abdomen in ascites and in unilocular cysts, but the wave of fluctuation will be found to extend nearer to the vertebræ in the former. In the well-filled cyst the projection of the vertebræ prevents the approach of the fluid to the lumbar regions. In multilocular cysts the wave of fluctuation is more broken, and frequently is only recognized as

a sensation of elasticity. The loss of strength is often more marked in ascites, while the appearance of emaciation is greater in the cyst. In renal and cardiac dropsy there is much greater disposition to anasarca. In a very advanced and large ovarian tumor the pressure may induce considerable dropsy of the

Fig. 529.—Relative Zones of Dullness and Resonance in Ascites.

extremities, but the abdominal distention is in much greater proportion.

On palpation the ovarian tumor presents greater resistance and can frequently be outlined and its surfaces distinctly deter-

mined. The abdominal surface can be moved over the tumor and the upper margin is easily recognized. The existence of adhesions or the presence of a large quantity of fluid may obscure the conditions. Percussion affords the most valuable information. In ascites there is a distinct zone of resonance over the

Fig. 530.—Relative Zones of Dullness and Resonance in Ovarian Cyst.

center of the abdomen, or the point of greatest prominence, while the more dependent portions are dull. The zone of resonance changes with the position of the patient. In ovarian cyst, on the contrary, there is dullness upon percussion over the whole

surface of the tumor, and resonance only after we have passed beyond its limits, which is unchanged by position. As the tumor, in its growth, presses the intestines upward and to the opposite side before it, the resonance will generally be discovered above, and on the side opposite to that upon which the tumor has originated. Occasionally, in a distended colon, resonance may be secured over it in ascites. When the abdomen is very greatly distended, or when inflammatory conditions bind down the intestines, resonance will be absent upon superficial percussion, but may be easily determined when more pressure is used. The pressure displaces the intervening layer of fluid and permits resonance to be obtained. In tubercular peritonitis and in hepatic dropsy, when the mesentery has undergone contraction and the peritoneum is very much thickened, the diagnosis can be so obscure as to require an abdominal incision to determine it.

Ascites may complicate an ovarian cyst, when, by displacement of a layer of fluid, the hand will come in contact with the cyst. The amount of resistance will afford information as to whether the tumor is solid or cystic. The complication of ascites can be regarded as an evidence of malignancy or of some degenerative process. The greater the amount of ascites, the more probable the malignancy. I have, however, seen very large ascitic accumulations from necrosis of a cyst after torsion of its pedicle. The uterus is freely movable in ascites, while in ovarian cyst it is but slightly movable, and displaced either downward and backward or upward and forward. In ascites arising from ruptured papillary cysts a dense, thickened mass is recognized upon each side of the uterus, which should cause a suspicion of its true character.

Localized Peritoneal Effusion.—Localized collections within the abdominal cavity offer great difficulties in determining the diagnosis. Such accumulations are generally the result of tubercular disease, and the history of the development of the disorder, the general condition of the patient, and careful investigation of the abdomen will afford an intimation as to its character. It was my misfortune recently to mistake a collection within the lesser peritoneal cavity for an ovarian cyst. The abdomen presented the characteristic appearance of a large ovarian cyst. A vaginal examination would have revealed the uterus and ovaries below a collection which did not dip into the pelvis, but, unfortunately, no such investigation was made. The diagnosis of ovarian growth was accepted upon the external appearance. Upon abdominal incision the general peritoneal cavity was free from fluid. An apparent cyst upon which the intestines were spread projected into the incision, from which over three gallons

of straw-colored fluid were withdrawn, and investigation demonstrated the character of the cavity.

Second, Is the tumor under observation an ovarian tumor? The physical signs vary with the size and situation of the tumor. In the early stage the tumor is entirely within the pelvis, and its position varies. When it reaches the size of a hen's egg, the tumor falls into the pelvis, where it remains until it becomes too large to be longer accommodated in that situation. Its relation to the corresponding side of the uterus permits its character to be determined by conjoined manipulation. When the growth has been complicated by peritonitis, the diagnosis may

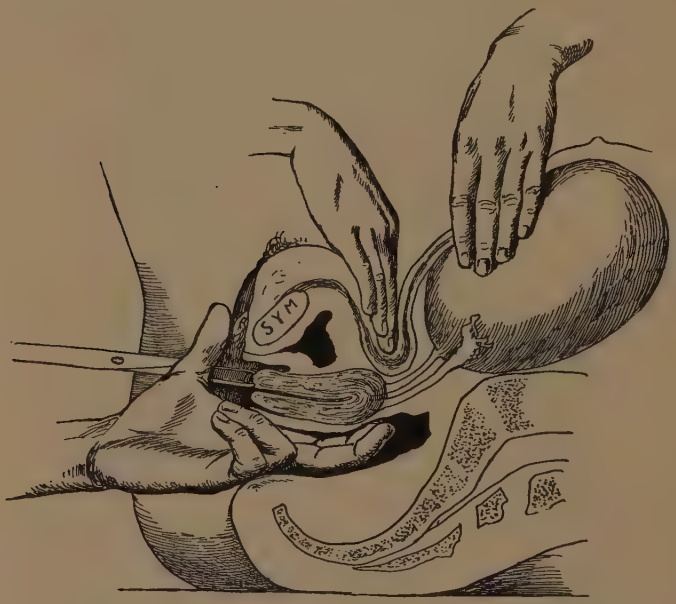


Fig. 531.—Hegar's Method of Determining Relation of Tumor to the Uterus.

be difficult. Small tumors usually feel firm because they are not sufficiently large to afford fluctuation, or even elasticity. The latter is of importance, and is generally absent in proliferating cystomata, in dermoids, and even in small single cysts. When we are unable to separate the tumor from the uterus, and consequently to determine the existence of a pedicle, the latter can be ascertained by Hegar's method. This, while the patient lies upon her back, consists in seizing the uterus with a vulsellum, and dragging it well down, while two fingers in the rectum follow its borders to determine its relation to the growth, or the hand over the abdomen can depress the fundus and thus recognize its rela-

tion. When a tumor is not large, it can usually be outlined by a hand over the abdomen and a finger in the rectum. The greatest difficulty is experienced when the tumor is complicated by inflammatory conditions, is fixed, and often incarcerated. Tumors which have originated in the broad ligament, and which lie in close relation to the uterus, are usually less spheric and circumscribed, and are less movable from their first inception. Fibroid tumors of the uterus and inflammatory growths of the tubes are likely to be confused with small ovarian cysts. These growths are pyosalpinx, hydrosalpinx, and hematosalpinx. The acute history, marked tenderness, evidence of inflammatory exudation, thickening, and matting together of the pelvic tissues, associated with marked pain, should distinguish the pyosalpinx. In hydrosalpinx the tumor can be movable, and may give a sensation of elasticity or fluctuation, but is oblong or gourd-like, rather than spheric. It is frequently closely adherent to the uterus, and affords a history of previous inflammation. A hematosalpinx is at first soft, then becomes hard from the coagulation of the blood. They are usually situated to one side of the pelvis and posterior to the uterus. Fibroid growths are firmer, and are closely attached to the uterus.

Large or Abdominal Growths.—A large ovarian cyst distends the abdomen, particularly at its lower part, rises abruptly from the pubes, and is sharply defined and generally symmetrically developed. Its outline, extent, and size are readily determined by palpation. In a large single cyst the surface will be smooth and regular, while in the multilocular cysts projections and irregularities are often found. If it is made up of a large number of small cysts, it will be more resistant, although it will still present a sensation of elasticity. These growths are confounded with pregnancy, hydramnios, extra-uterine gestation, uterine myomata, retroperitoneal growths, and the tumors of the various viscera of the abdominal cavity.

Pregnancy.—The enlargement of the abdomen is more rapid than in ovarian tumor. It is generally associated with suppression of the menses and with the presence of such sympathetic nervous phenomena as nausea, vomiting, disturbed appetite, and, in the more advanced stage, a florid, healthy appearance of the patient. Suppression of the menses is not a constant symptom of pregnancy, for there are some women who continue to menstruate during the entire pregnancy, nor is amenorrhea always absent in ovarian growths. Error is more likely to occur in the unmarried, during the early stage of pregnancy. The physician should refrain from making a diagnosis until he has had an opportunity to make a careful examination, and then should hesitate to express an opinion when there is the least reason for

doubt. An examination a few weeks later will dispel the uncertainty. There is an absence of fluctuation in pregnancy; but it is also absent in cysts with thick, viscid contents, or in the areolar and glandular varieties, which are made up of a large number of small cysts. As pregnancy advances, the fetal movements, heart-sounds, and parts of the fetus are recognizable. The heart-sounds are pathognomonic of pregnancy, but are not always heard, owing to the position of the fetus, the large quantity of fluid, or to fetal death. The conjoined manipulation will afford information as to the relation of the enlargement to the uterus. Gestation in one horn of a bicornate uterus can make the diagnosis difficult, but a careful bimanual exploration will demonstrate the association of the enlargement with the uterus, and the small undeveloped cornu in association with the enlargement. Under no circumstances should the size of the uterus be determined with a probe when there is the least suspicion of pregnancy.

Hydramnios.—Hydramnios is a pathologic form of pregnancy in which there is a more or less large collection of amniotic fluid in the uterine cavity. Cases in which the collection exceeds two quarts have been mistaken for ovarian cysts. In large collections the abdominal cavity becomes greatly distended; its surface is smooth, white, and glistening, and fluctuation is very distinct. The patient suffers all the discomfort characteristic of a large cyst. The history will prove of value in determining the diagnosis. Hydramnios generally occurs suddenly, and makes its appearance about the sixth or seventh month of a pregnancy which has previously run a normal course. Such symptoms could arise only from an ovarian cyst which had undergone some marked change in its nutrition, but this diagnosis would be excluded by the previous indications of pregnancy. The physical examination of such a patient will disclose an enlarged uterus, the cervix of which is frequently obliterated, os open, and covered with a dense membrane, through which, by manipulation, we are often able to distinguish parts of the fetus or obtain ballottement. Rupture of the membrane is followed by the discharge of a large quantity of water and the evacuation of the uterine contents. It should not be overlooked that the existence of an ovarian cyst does not preclude the occurrence of pregnancy, and the presence of the latter, by the increased flow of blood to the pelvis, may facilitate the growth of the cyst. As we have already seen, the rapidity of the growth may be so great as to require early interference in order to save the life of the patient. Careful examination will usually disclose an enlarged uterus either in front of or behind the cyst.

Extra-uterine Pregnancy.—An ectopic gestation which has

attained a size sufficient to permit it to be confused with an ovarian cyst will have presented the symptoms of early pregnancy, possibly indications of rupture of the sac and internal hemorrhage. Later, the tumor may be found to one side of or behind the uterus, and so closely adherent to it as to render the differentiation from it exceedingly difficult. In advanced stages the fetal movements and the heart-sounds may be heard. Vaginal palpation will disclose the fetal parts covered with a thin wall. After the death of the fetus other changes occur which render the diagnosis still more difficult. The fetus shrinks, becomes macerated, and the decomposition produces an accumulation of gas, which, with the distinct fluctuation, makes the condition doubly obscure. A careful analysis of the subjective symptoms, associated with a thorough examination, will generally permit its recognition.

Uterine Myomata.—Generally, the slow growth, the resistance of the tumor, and the usual presence of multiple growths, their irregular contour, and their demonstrable relation to the uterus, should afford confirmation of the diagnosis. A tumor which has but recently come under the observation of the patient, and which has, through degenerative or obstructive processes, taken upon itself rapid growth, may afford considerable difficulty in ascertaining its true character. The difficulty becomes very great in edematous fibroids and in fibrocystic tumors. It would seem that the demonstration of the continuation of the mass with the cervix would be sufficient to demonstrate the uterine origin. Double ovarian cysts, particularly when the pedicle is short or absent, may so drag upon the fundus uteri as to make it apparent that the growths are a part of the uterus. The relation of the uterus to the tumor is best determined by grasping the cervix with a vulsellum, which is held by an assistant; a second assistant draws up the tumor through the abdominal walls, while the principal, with one or two fingers in the rectum, and the hand over the abdomen, seeks the pedicle and ascertains its relation to the uterus. This procedure, even in double growths, will permit the fundus to be recognized and the nonuterine character of the growths to become known. In the early history of abdominal work not infrequently the abdomen was opened for an ovariotomy and a uterine fibroid was discovered. Indeed, the earlier removals of the uterus were cases of mistaken diagnosis. Uterine myomata may complicate the presence of an ovarian cyst, and the consequent distention of the abdomen from the presence of two large tumors may render earlier interference desirable. The ovarian cyst may be situated in front

of the myomatous uterus, and the growth may be unsuspected until discovered during the progress of an operation.

Retroperitoneal Tumors.—Retroperitoneal tumors are very rare. They may originate from the tissue in the pelvis or from that of the subperitoneal portion of the abdomen. The more fixed position of the mass, the recognition of resonance over the tumor, and, particularly, the ability to demonstrate, through rectal palpation, the presence of the rectum in front of the tumor will assist in the diagnosis.

Other Abnormal Collections and Growths.—The uterus can present morbid collections, such as physometra, hydrometra, and hematometra. Physometra is a collection of gases within the uterus, the product of decomposition, and is a rare condition. Hydrometra, a collection of watery fluid within the uterus, mostly occurs in women of advanced years, and is caused by retention of the secretions after obliteration of the canal. Hematometra is a collection of blood in the uterus,—as the retention of the menstrual discharges from occlusion of the cervix or vagina,—and it mostly occurs near puberty. Inspection and bimanual palpation are sufficient to disclose the cause. The situation of renal and hepatic cysts is sufficient to release them from the suspicion of an ovarian origin.

Third, the relation of the tumor to the surrounding parts, the character of the pedicle, and the presence of adhesions:

Adhesions.—The mobility of the tumor is dependent upon the length of the pedicle and upon the absence of adhesions. A tumor which can be pushed up without much dragging upon the uterus, displaced from side to side, and the abdominal walls recognized as sliding over it, is reasonably free from adhesions, and has a long pedicle. A tumor which is situated upon one side of the pelvis, and pushes the uterus to the opposite side, and which is quite immovable, or drags upon the uterus as it is moved, is, without doubt, an intraligamentary cyst. Rapid enlargement, tenderness of the abdomen, and a sensation of crepitus as the abdominal wall is being moved over the tumor indicate recent and extensive adhesions, the result of peritonitis. Limited adhesions with omentum, intestines, and abdominal wall can not be excluded. In very large cysts it is frequently difficult to diagnose the presence of adhesions. Information can often be secured by observing the respirations. In deep inspiration we can feel and see the upper pole of the tumor pushed down, unless it is fixed. The ability to drag the uterus down will assure its freedom. If the fundus uteri remains high when the bladder is empty, it is adherent. The history is valuable, as adhesions occur in torsion of the pedicle, in inflammatory changes, and from traumatism.

Torsion of the pedicle is recognized by the complication of an ovarian tumor with sudden and severe peritoneal symptoms. These are severe pain in the belly, meteorism, vomiting, elevated temperature, rapid growth of the tumor, and tenseness of its surface, which indicate that the torsion has been followed by intracystic hemorrhage or increased exudation.

When the patient is seen long after the torsion, the tumor is everywhere adherent, and the patient may show distinct evidences of marasmus. Sudden collapse, followed by symptoms of internal hemorrhage and by peritoneal irritation, indicate the occurrence of an internal hemorrhage. In the acute stages of torsion it is often difficult to arrive at a differential diagnosis from rupture of an ovarian cyst, peritonitis, perforation of the stomach or intestine, renal or gall-stone colic, ileus, and rupture of an ectopic gestation. An attentive consideration of the history and progress of the disorder will lead to a direct conclusion. Inflammation of a tumor is determined by the accompanying symptoms. The tumor is very sensitive, and presents a spontaneously localized, sometimes radiating pain. The tumor may suddenly enlarge, or the suppuration may lead to the formation of gas and the development of a tympanitic resonance. Perforation of a suppurative tumor into the bladder or intestine is recognized by tenesmus and irritation of the bladder or by diarrhea and intestinal colic. Perforation is certain if portions of the tumor or its contents are found in the discharges. Rupture of a cyst is determined by the associated phenomena. Sudden oppression, suffocation, nausea, sometimes vomiting, diarrhea, acceleration of the pulse, and moderate elevation of temperature indicate the entrance of fluid into the peritoneal cavity. This is rendered more probable by strong diuresis and a perceptible decrease in the size of the tumor, with the presence of free fluid in the peritoneal cavity. The distinct tumor limits are not found, and there is no alteration of resonance with change of position.

Fourth, the variety of the ovarian tumor. The glandular proliferating cyst is the most frequent form and attains the largest size. These tumors are mostly multilocular, and consequently present a less marked wave of fluctuation upon palpation. Fluctuation is an indication of the cystic character of the tumor, and is very distinct in the unilocular and large-chambered varieties. Instead of fluctuation we often find a kind of elasticity, which can be produced by edematous solid growths, and in large cysts the contents of which are made up of colloid or very thick, viscid material. In some cysts, instead of fluctuation, only a kind of vibration is determined. In fluctuating or tough elastic tumors which are nodular we

will probably find a cystadenoma. A large fluctuating tumor is not necessarily a unilocular cyst, because it may contain within it numerous small cysts.

Generally, a small cyst which presents no symptoms is not a cystadenoma, but may be a dermoid, a parovarian, or, more probable than either, a simple retention cyst of the ovary or a simple serous cyst. Dermoid tumors are recognized by their irregular consistency—in some places soft, in others hard. A doughy feel has been ascribed to them, but this is rare, as the fatty material at the body-temperature is fluid, and it is only in the presence of a large amount of hair that the doughy sensation can be elicited. The determination that the tumor had been in existence for ten or more years would justify the suspicion of a probable dermoid. Olshausen says that parovarian growths are mostly determined by their moderate size, slow growth, thin and relaxed walls, the translucent fluid contents, and the very distinct fluctuation. Parovarian tumors, as a rule, are spheric, though from their relaxed condition they may assume other forms, especially when pressed into the pelvis. Large cysts are generally multilocular. The presence of double intraligamentary growths, as well as of ascites with small tumor formation, is a presumption, but not a positive indication, of papillary growths, as the conjunction of symptoms is found in all tumors. Superficial papillomata feel firm, nodular, and are often diffusely extended in the pelvis. In a rapidly developing ascites, in which renal, cardiac, and hepatic causes can be excluded, the presence of bilateral resistance in the pelvis should awaken a suspicion of ruptured papillary ovarian cyst. A pronounced solid consistency of the growth is common to ovarian fibromata, sarcomata, endotheliomata, carcinomata, and teratomata.

It should not be forgotten that cystic conditions can complicate in all these tumor formations. As a rule, ascites is present, and this, by increasing the difficulty of palpation, renders the diagnosis more uncertain. The fibromata and the fibrosarcomata are less nodular, of quite firm consistence, and are more frequently situated upon one side. Sarcomata and endotheliomata are generally softer. The solid carcinomata are mostly bilateral, quite nodular, and offer a sensation of toughness. There are no positive indications that a tumor is benign or malignant, as a cystadenoma may contain masses of cancer material. Ascites is generally regarded as an indication of malignancy, but it occurs in pseudomucin cysts, papillary growths, and with the fibromata. Hard consistency and an irregular surface are also reasons for suspicion, but are not positive indications. Early adhesion of the vault of the

tumor, which prevents the vaginal wall from being moved over it, is an indication of malignancy, when abscess formation can be excluded.

The age of the patient is of little significance, as the age of puberty is inclined to the formation of cancer, and all varieties of ovarian tumor can occur at any period of life. Proper metastases, as distinguished from peritoneal implantation, are of significance, but it is not always easy to demonstrate these metastases, as they do not always cause symptoms, or are not perceptible because of the abundant ascites. In other cases metastases will have been discovered in the vagina, the parametrium, and the rectal and peripheral lymph-glands before operation, fixing the diagnosis of malignancy without question. Pronounced cachexia and marasmus may be produced by certain complications, such as rupture, torsion, and inflammation; also in tumors of enormous size. Rapid growth, especially in children, speaks for malignancy. Olshausen directs attention to the premature edema of a leg as a symptom of cancer.

640. Exploratory Puncture.—In obscure and complicated cases it was formerly the rule before resort to operation to draw off a portion of the cyst-contents for chemic and microscopic examination. The fluid may have such pronounced physical properties as to reveal the true character of the growth. The thick colloid material from proliferating cysts can be mistaken for nothing else. If the fluid is serous, the possibilities of origin are numerous. It may have been furnished by a parovarian cyst, a serous ovarian tumor, a cystadenoma, ascites, hydronephrosis, and echinococcus sacs. In uncomplicated cases the fluid may possess such chemic properties as will aid in the differentiation, but frequently these properties are lost through complications, such as serous transudation and an admixture of blood. The fluid from a proliferating cyst is thick and colloid, with a specific gravity of from 1015 to 1030, and contains paralbumin and cylindric cells. In the papillary cysts there is an absence of paralbumin, while white blood-corpuscles are revealed by the microscope. The fluid from the Graafian follicles does not differ from that of the parovarian cysts. Ascitic fluid is thin and of a light yellow or greenish color, from which albumin is coagulated upon boiling, but no cylindric epithelium is found, and the specific gravity is from 1008 to 1015. In the cystic fibroma the fluid is of a lemon-yellow color, has a specific gravity of 1020, coagulates rapidly without heat, and contains no cylindric epithelium. The fluid from echinococcus cysts presents hooklets, has a specific gravity of from 1008 to 1010, and does not contain albumin. In hydronephrosis the fluid is thin, with a specific gravity of from

1005 to 1018; its color varies, and it contains urea, leucin, tyrosin, and kreatinin. Puncture of a cyst is always attended with danger, and when performed in doubtful cases, for diagnostic purposes only,—as in the echinococcus cysts, renal tumors, abscesses, and dermoids,—is attended with the most serious consequences: the intestines and bladder have frequently been punctured; fluid may escape into the peritoneal cavity and cause peritonitis; or air may enter the sac and result in inflammation and suppuration; a large vessel in the sac-wall has been injured, and a severe and dangerous hemorrhage has resulted. Neither chemic nor microscopic examination of the cyst-contents affords positive information, and the inferences thus secured do not compensate for the increased danger the patient undergoes.

641. Exploratory Incision.—In cases in which we find it impossible to arrive at a positive diagnosis, as in tubercular peritonitis, in malignant disease of the ovary, tube, or omentum, or in papillary cysts, a button-hole incision, sufficiently large to permit the introduction of the finger, will be a far safer procedure than puncture, and will afford an opportunity to determine the condition by touch, and will permit subsequent drainage. It should be done under all antiseptic precautions, and every preparation should be made to complete the operation if the conditions will permit. While this procedure is unattended with great danger, its indiscriminate practice is unjustifiable. It should not be utilized to secure information that may as well be secured by the bimanual examination. When the latter procedure has demonstrated an inoperable malignant condition, for instance, the incision should not be made merely for confirmation of the decision.

642. Treatment.—That an ovarian cyst is not amenable to medicinal treatment is evident when we consider that the fluid is contained within a shut sac, which has its own secreting surface. The administration of remedies, and the application of counterirritants with a view to increase secretion and elimination, must be without avail. Electrolysis has had its advocates, but when we consider the character of these growths, and the danger from infection many of them must present, the folly of such treatment is evident. Surgical treatment should consist in extirpation. Puncture is but a palliative procedure at best, for the removal of the fluid is quickly followed by its re-formation, and it requires more and more frequent withdrawal, which proves a severe drain, through the great loss of albumin. As has been stated, it is associated with danger from the puncture of a large vessel in the tumor wall, and the consequent hemorrhage; from the possibility of infection by

escape of the contents of a papillary cyst, or the rupture of so thin-walled a cyst and the escape of its contents into and over the peritoneal cavity; and, lastly, from septic infection. Puncture may be resorted to as a temporary measure in a tumor complicating pregnancy, when the cyst is so situated as to form an obstruction to labor, and then should be performed through the vagina, after the most thorough cleansing of that canal. Puncture of a cyst through the rectum, under any circumstances, is an unjustifiable procedure.

643. Ovariotomy.—Extirpation of the tumor, or, as the operation is known, ovariotomy, is the only operation worthy of consideration as applicable to all cases. Success in its performance will depend very much upon the care with which the diagnosis has been made, the knowledge of the operator as to the condition of the patient, the dexterity with which the operation is performed or the readiness in meeting complications, and the judicious treatment of the patient subsequent to its performance.

644. Indications.—The recognition of the danger of every operation upon the peritoneum led the early operators to postpone interference until the patient had begun to experience marked discomfort and was suffering in general health from the pressure of the growth. The introduction of the principles of antisepsis and asepsis have rendered postponement unnecessary. A more careful study of the progress of the growths has demonstrated that it is unwise to postpone operation after a tumor has attained a growth sufficient to permit of diagnosis, because of the various complications which can develop. A large proportion of ovarian tumors are of a malignant character. Schultze places the proportion of malignancy at 27 per cent. of all ovarian tumors; Ruge, at 15 per cent. These variations are dependent upon their appreciation of the relation of papillary formations to malignancy. Pfannenstiel found among 400 cases in which were included parovarian tumors that 19 per cent. were malignant. Reckoning the papillary adenomata, the number equaled 26.15 per cent.—a proportion that agrees with the estimates of Schultze and Leopold. It will be seen from these statements that about every fourth or fifth ovarian tumor can be considered malignant. The diagnosis of malignancy can not be made with certainty. If it is recognized that safety in these cases lies in the earliest possible extirpation, it will be evident that in one-half of all the cases the early extirpation of the tumor will be indicated. Absolutely benign growths of the ovary are unlimited in their size, and thus cause symptoms which imperil the life of the patient and lengthen the time required

for recovery. Delay favors the development of complications which, if they do not threaten life, create conditions that render the later operation more difficult and the prognosis less certain. These circumstances, with the present favorable prognosis of ovariotomy, render it desirable that every ovarian tumor should be subjected to operation as soon as it attains a size sufficient to permit of its diagnosis. It was formerly advised to wait until the tumor had reached a size that would permit it to rest upon the pelvis, but no limit is now known, and the operator prefers to remove the tumor as soon as the patient's permission can be secured. The inability to determine the exact character of the growth, and the possibility of very small papillary tumors infecting the entire abdominal cavity, make early operation advisable.

The severity of the symptoms only come into consideration as they assist the patient in arriving at a favorable decision. The difficulties of the operation should not be a cause for delay, as they will not become less by waiting. The stage of life plays no rôle in the decision unless the growth is complicated by acute tubal disease, which may render temporary delay desirable.

The indication for operation should be considered as urgent when the tumor begins to grow rapidly or when symptoms of threatening complications appear. Compression of the lungs, symptoms of uremia, of ileus, of intraperitoneal or intracystic hemorrhage, or rupture of the cyst must be considered as urgent and vital indications. More frequent complications are torsion of the pedicle and inflammation and suppuration of the cyst. The existence of peritoneal irritation has been considered as a reason for delay in operating, but now we realize that the patient has a much better prognosis through early operation than when it is delayed.

645. Contraindications.—The reasons for withholding operation may be transitory or permanent; the former, in severe complicating diseases, as intercurrent fevers, bronchial catarrh, especially in the aged, progressive weakness from loss of blood, or obstinate gastro-intestinal catarrh. The menstrual period is sometimes regarded as such a cause, but as it does not increase the danger of infection, it is no bar. The permanent contraindications are: irrecoverable disease of the heart, lungs, kidneys, or liver, marasmus, especially senile, and such diseases as will in a short time certainly lead to death. While pulmonary tuberculosis, valvular disease of the heart, and nephritis are contraindications, ovariotomy occasionally decreases the danger from the lesion.

Age is no contraindication, as a number of successful opera-

tions after the age of eighty are reported. The mortality of 100 cases operated upon after the age of seventy was 12 per cent. (Kelly). Ovariotomy is not contraindicated by age unless the tumor is associated with some disease which will render death certain in a short time.

A number of anatomic contraindications were formerly recognized, among which were adhesions, intraligamentary growths, and the existence of malignity. Adhesions are no longer considered a reason for delay, and frequently the relation of the tumor to the broad ligament is discovered only during the operation. In the majority of cases the attempt at the operation only terminates with its completion. While the most trifling hope of recovery exists, and no traces of cachexia and metastasis formation are present, the operation should not be considered as contraindicated.

646. General Considerations.—Unless immediate operation is indicated by torsion of the pedicle, rupture of the cyst, or indications of cystic hemorrhage, two days should be occupied in the preparation of the patient, during which the pulse, temperature, condition of the respiratory organs, and urine can be studied. In complicated cases the procedure may be longer delayed, until the condition of the patient can be corrected. In very large cysts, with marked edema and dyspnea, many authors advocate a preliminary puncture, in order that the lungs and kidneys may have a few days to recover their functions before the major operation is performed. Because of its many disadvantages, puncture should be done very infrequently. For the performance of ovariotomy the following assistants are desirable: First, a principal assistant, who stands opposite the operator; second, the anesthetist; third, a nurse or a physician to arrange and serve the ligatures and sutures; fourth, a second nurse, to care for the sponges; and, fifth, a nurse to serve in changing the water for the sponges and for the hands of the operator and his assistant. All these persons should be trained to know and to do their duty. Directions for their preparation are given. (Section 115.)

Instruments.—A knife, two pairs of scissors, two long dissecting forceps, twelve small and six large clamp forceps, two ligature carriers, a needle-holder, an angiotribe, a trocar, a tube, two pairs of cyst forceps, and two short and four long curved needles, each threaded with a double silk loop for carriers, should be provided. The instruments should be carefully sterilized and placed in sterile trays. The patient should be placed upon a suitable table, with her feet toward a good light. An ordinary kitchen table will serve well. The operator stands to the patient's left and his assistant opposite. To the right

of the operator is a table, upon which are placed the tray containing the instruments; a smaller one, for the needles and ligatures; and a basin with sterile water, for the hands of the operator, which should be changed as often as it becomes soiled. Behind the principal assistant stands another table, on which are two basins for the sponges or pads, and a third for the assistants' hands. The soiled sponges are washed out in one of these basins and placed in the other, from which they are squeezed out and handed to the assistant for the operation. These sponges should be accurately counted before the operation is begun, and all should be accounted for before the wound is closed. Want of care may result in the retention of a sponge, a pad, or even an instrument within the abdominal cavity, to the great disadvantage of the patient and to the discredit of the surgeon. A third table should hold the dressings, ready for application. There should be on hand in the room hot and cold sterilized water, at least five gallons of each, slop buckets, a normal salt solution for irrigation of the abdominal cavity,

Fig. 532.—Cyst Forceps.

and a suitable apparatus for hypodermocleisis or transfusion, if the condition of the patient should demand it. In addition, there should be within the reach of the anesthetizer a hypodermic syringe and solutions of strychnin and atropin.

647. Operation.—The description of the operation we prefer to divide into steps or stages, and to describe the method of procedure in each. We can thus afford the operator a graphic outline of the various accidents which can occur, and the methods to which he may be compelled to resort as he proceeds. He will be unlikely to mistake his course on the journey if an accurate chart of each portion is furnished him.

The different stages are:

1. The incision of the abdominal wall in the median line or through one rectus muscle, securing all bleeding vessels with hemostatic forceps before the peritoneum is opened. (See Section 133.)

2. The puncture and evacuation of the cyst.

3. The removal of the cyst and management of the adhesions. (See Section 134.)

4. The method of controlling the circulation through the pedicle.

5. The examination of the other ovary and of the general peritoneal cavity for bleeding vessels; the removal of all gauze pads. (See Section 135.)

6. Drainage. (Sections 136, 137, 138, 139, 140.)

7. Closure of the wound. (Section 141.)

8. Dressing. (Section 142.)

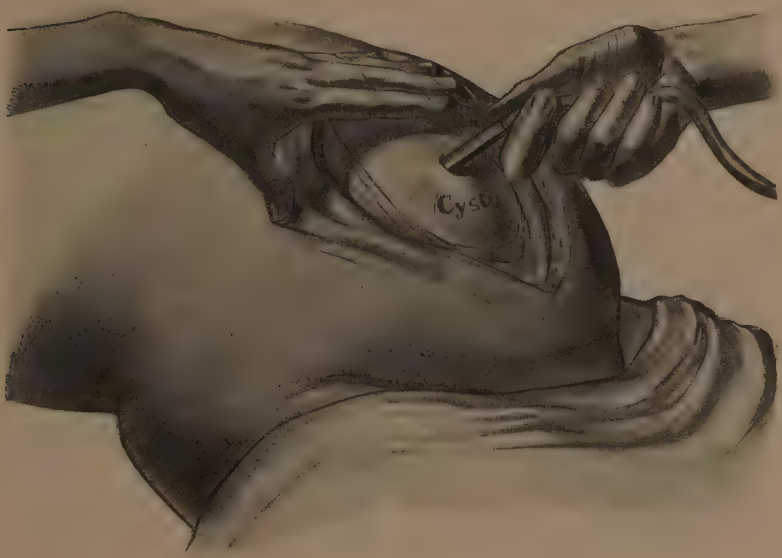


Fig. 533.—Wall Incised; Cyst Exposed.

1. *The Incision of the Abdominal Wall.*—It was formerly preferred to open the abdominal wall in the median line, cutting through, if possible, the linea alba. It is, however, better to cut through one or the other rectus muscle, as the subsequent apposition of the various surfaces secures a stronger ventrum. The linea alba is the weakest part of the abdominal wall, hence it seems unwise to increase its weakness by making a wound through it when the incision to one or the other side when properly united will be as strong as before it was made. There is a little more tendency to bleeding when the incision is made through the rectus muscle; but it is easily controlled by hemostatic forceps, and if it continues to bleed after their

removal, the ligation of the bleeding vessels can be easily accomplished. The peritoneum is picked up, pulled away with two pairs of forceps from the tumor wall and an incision is made through it. This avoids injury to the tumor wall or to a knuckle of intestine which might be situated over it. The peritoneum is incised the length of the wound so that it will not be likely to be pushed off during the subsequent manipulation.

2. *Puncture and Evacuation of the Cyst.*—A number of more or less ingenious trocars have been devised for evacuating the contents of the cyst. What is required is a cannula with a tube attached, through which the fluid can be carried to a re-

Fig. 534.—Cyst Punctured and Being Withdrawn.

ceptacle beneath the table. The simpler and more readily cleansed this apparatus, the better. A glass nozle for a fountain syringe, together with three feet of rubber tubing, will serve very well. A glass tube of larger caliber will prove more effective when there is a large quantity of fluid to be evacuated, or where the fluid is very viscid. A cannula, however, is not a necessary part of one's equipment, for the cyst contents can be readily evacuated through a knife thrust, but at the expense of greater soiling of the room and clothing.

The point chosen for puncture should be situated toward the upper portion of the wound, so that the contraction of

the emptying cyst will not draw the opening within the abdomen. As the cyst contracts, its opening can be drawn through the wound to serve as a funnel to carry away the fluid. When the cyst is a large one, I would advise that the patient be turned upon her side, the assistant making firm pressure to keep the cyst pressed into the wound as it empties. This position favors the rapid evacuation of the cyst contents, with the least danger of the entrance of the fluid into the peritoneal cavity. When the operator has provided himself with sterile basins he can collect the fluid and obviate soiling of the body of the patient, her sterile environment, and the room with its contents. The lateral position also is favorable in necrotic cysts, as it permits

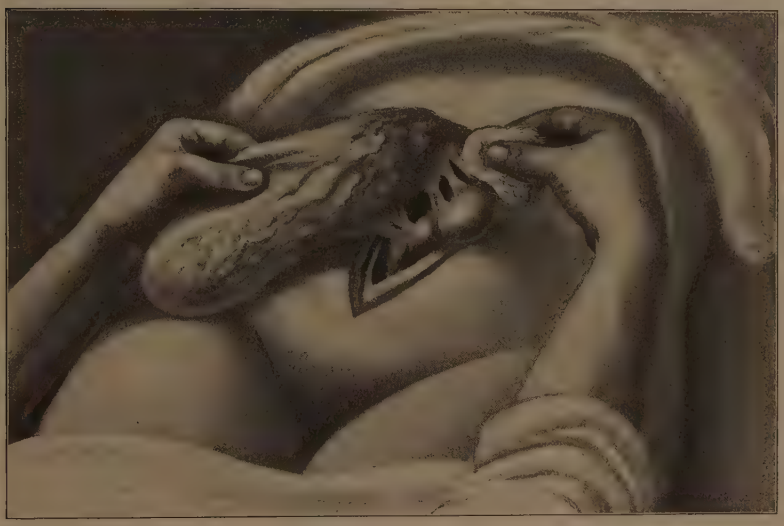


Fig. 535.—Withdrawal of Sac, Showing Adhesions.

their removal with less soiling of the general peritoneal cavity. The precaution to obviate soiling the peritoneal cavity is especially important when the cyst contents are purulent. The careful observations of Watkins have demonstrated that the contents of these cysts are often especially virulent, producing fatal peritonitis or other form of sepsis whenever the infection has found lodgment within the abdomen. Large vessels in the cyst-wall should be avoided in making the puncture. Gauze pads should be held about the margins of the wound while an assistant with both hands upon the abdomen keeps the cyst-wall pressed against the abdominal wound. When a cannula is not employed, the operator should seize the edges

of the cyst wound and forcibly draw them out. This protects the peritoneal cavity from any soiling, especially when the patient occupies the lateral position. When a cannula is used, the relaxed cyst upon either side of the cannula is caught with suitable forceps and drawn out. In nonadherent cysts this procedure will permit the removal of the sac, when empty, without any soiling of the abdominal cavity. In multilocular cysts the largest cyst exposed is first evacuated, through which succeeding cysts may be evacuated, drawing the first out to serve as a funnel. Areolar and dermoid cysts are best removed without effort at their reduction, because the contents, especially of the latter, are irritating to the peritoneal cavity and difficult to remove from it. Occasionally, the cyst-contents are so viscid that they refuse to run through the cannula. The edges of the puncture are seized and the sac is drawn forcibly

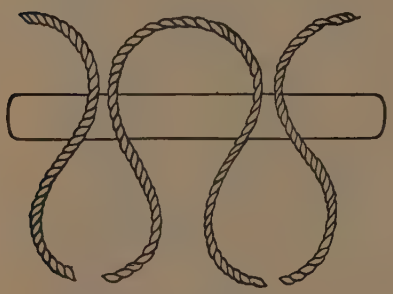


Fig. 536.—Ligatures Introduced through Broad Pedicle.

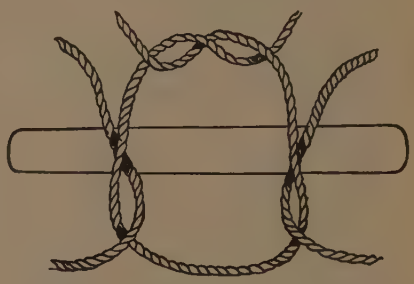


Fig. 537.—Interlacing of Sutures to Prevent Splitting of Pedicle.

against the wound, while the opening is enlarged and the jelly-like contents are scraped away.

4. *Management of the Pedicle.*—When the tumor is large and heavy, the pedicle may be seized with clamp forceps and the cyst cut away, after which the stump should be crushed with the angiotribe, and ligated in sections, or ligatures applied only to the larger vessels. When the pedicle is long and thin, a ligature may be thrown around it and tied in the groove made by the angiotribe. In a short, broad pedicle this is not feasible, but the section method, illustrated upon these pages, serves an excellent purpose.

When tied in several sections, the ligatures should interlace, in order to prevent the pedicle from splitting. The Downes electric angiotribe affords an excellent method of securing against hemorrhage, and leaves the wound without the irritation of a foreign body. In a cyst without a pedicle the sac should be enucleated and the vessels secured as the operation pro-

ceeds. These cases present some of the most trying problems within the realm of abdominal surgery. In cutting away the tumor the precaution must be exercised to retain a sufficient button to prevent the ligature from slipping. If a ligature slips on a short, broad pedicle, the parts spread out, the vessels retract, and serious hemorrhage occurs, which may be difficult to control. Sometimes the ovarian or uterine artery slips back and forms a hematoma in the stump, which so fills up the tissues as to make sufficient traction upon the ligature to withdraw the tissue, from which a fatal hemorrhage follows. The tendency of the tissue external to the ligature to shrink after the removal of the tumor should not be forgotten, and when the traction is severe, a second ligature may be judiciously placed behind it to inclose the ovarian artery. Silk, wire, and animal ligature have been employed for securing the pedicle. Silk, from its strength, ease of preparation, and small amount of material required, is most frequently employed. I prefer the chromic catgut, but the precaution must be exercised to tie it tight and to leave a secure button, because of its greater propensity to slip. Other methods of securing hemostasis have been employed: the vessels have been twisted; for many years the pedicle was brought out of the wound and clamped; Keith applied a temporary clamp and charred the tissues with the hot iron; Skene improvised a set of electrocautery clamps, by which the tissues are slowly burned through and the application of the ligature is avoided. This apparatus has been greatly improved and made practicable through the ingenuity of Dr. A. J. Downes, of this city.

Fig. 538.—Sutures Interlaced and Tied.

General Considerations.—The study of the differential diagnosis of ovarian tumors should have prepared the operator to appreciate the fact that, after the most careful investigation of his cases, he must not infrequently expect to meet with conditions entirely different from those which the physical signs have indicated. Not infrequently what appears a simple ovarian cyst will present complications that it will test the ingenuity of the most experienced operator to overcome. The inexperienced operator should prepare himself for every emergency, and should have previously planned for them, as the prudent general plans for the coming battle. The more carefully the case has been studied, the patient prepared, and the emergencies anticipated, the more certain will be the success. It is far

better to go to unnecessary preparation many times than to be unprepared once. Patients with large ovarian cysts frequently suffer from pressure symptoms, and are greatly benefited by previous purgation, stimulation of the secretion of the kidneys and skin, and the administration of strychnin and atropin to strengthen the action of the heart and vessels. In the incision care is exercised to avoid pushing off the peritoneum and to escape injuring the bladder, a loop of intestine, or the cyst. The bladder may be drawn up to a higher level by adhesions to the cyst. It is recognized by the arrangement of the muscle-fibers in its wall. The parietal peritoneum is occasionally inseparable from the surface of the tumor along the line

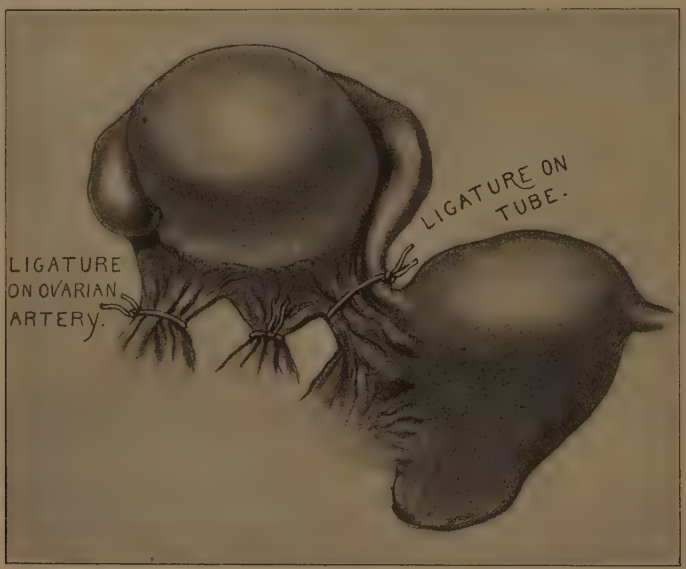


Fig. 539.—Splitting of Pedicle when Sutures are Tied without Interlacing.

of incision, when the cyst may be opened and emptied before proceeding to the separation of the adhesions.

The intestine is rarely in danger of injury during this stage of the procedure, but occasionally a loop may be situated in front of the cyst.

The removal of a cyst should be followed by the examination of the remaining ovary. Frequently it will be found to be the site of a cyst which would otherwise be overlooked.

The toilet of the peritoneum should not be understood to mean thorough drying of the cavity; indeed, much sponging and manipulation of the peritoneum are injurious, and favor

the formation of adhesions. The cavity is most readily cleansed, and with the least injury, by irrigation with normal salt solution. The retention of a considerable quantity of the fluid is beneficial, in that it favors peristalsis, and by its absorption replenishes the liquid waste. Ragged omentum and shreds or bands of adhesions should be removed. When the irrigating fluid continues to come away bloody, careful examination should be instituted to ascertain the source of the bleeding. The abdomen must not be closed while a considerable quantity of blood is being lost. Unless the abdomen has been soiled with infective cyst contents it is better not to irrigate. If the precaution has been exercised to protect the cavity by gauze packing, irrigation will be very infrequently required. A saline solution is probably the least irritating of anything that can be introduced into the peritoneal cavity, but even it handicaps to some degree the functions of this extensive absorbing surface.

Post-operative Treatment. (Section 143.)

648. Incomplete Operation.—The conditions in which the operation has not been completed are most frequently those of intraligamentary parovarian cysts, and particularly papillary cysts. The structure of the broad ligament is more or less involved, and not infrequently adhesions affect a large portion of the intestine. The more experienced the operator, the less frequently will the incomplete operation be performed. With judicious measures, cases in which the operation can not be completed are exceedingly rare. In the intraligamentary variety an incision of the peritoneum, where it is situated about the base of the tumor, is made, the tumor is drawn up, forming a pedicle, and the tissue is pushed off by blunt dissection. Sometimes the tumor may be opened and an incision made at its base, by which the sac is then dissected out. Frequently it is advisable to precede the operation by ligation of the larger vessels, particularly the ovarian arteries, after which the dissection can be accomplished with less hemorrhage. Adhesions, when in the cords and bands, can be cut with the Paquelin cautery. In the papillary variety it is very important that the mass should be removed, even if it is necessary to extirpate the uterus to accomplish it. Frequently what seem desperate cases recover when the original source of the disease is removed, even though extensive infection of the peritoneal cavity has occurred. When adhesions are very extensive and the condition of the patient such as to preclude the possibility of complete removal of the sac, its cavity should be emptied, cleansed, and sutured to the parietal peritoneum of the abdominal wall, while the remaining portion of the wound is closed. The sac

cavity is packed with iodoform gauze. Thus it may be kept open, irrigated from time to time with disinfectant solutions, and the packing renewed until the cavity fills by granulation. This procedure is necessarily attended with increased danger to the patient, as it is impossible to keep such a wound completely aseptic.

When a tumor is deeply situated in the pelvis, the abdominal opening may be closed after an incision has been made through the base of the tumor into the vagina, through which the end of the gauze packed into the cyst may be carried. Over this gauze the cyst-wall is closed, and covered, when possible, with peritoneal flaps. Intraligamentary tumors are sometimes pushed up into the mesentery, and the removal of the mass necessitates the ligation of important branches of the mesenteric artery. When a large portion of mesentery is thus ligated, the vitality of the portion of intestine supplied by it is endangered and gangrene of the gut may result. Such cases may demand the excision of the affected portion of the intestine and an end-to-end anastomosis. In metastasis of the papillary variety into the omentum, forming, as it frequently does, good-sized masses involving the entire omentum, the latter should be removed after ligation of its base with a number of catgut ligatures. It was my privilege, in a patient who had double-sided papillary ovarian cysts, with extensive ascites from the infected peritoneum, and who had been subjected three times to abdominal section for the evacuation of this fluid, to remove both ovaries and the greater part of the uterus after an extensive dissection. The entire omentum was also removed. This patient, in whom the dropsical effusion had previously collected so rapidly that they were unable to get her out of bed after operation before the fluid had reaccumulated, had no recurrence of effusion subsequent to the complete operation, and two years later was in good health.

649. Rupture of the Cyst.—In cysts of the glandular variety which have been greatly distended, or when the pedicle is partly twisted, the cyst-wall becomes fragile and is easily torn, permitting its contents to escape into the abdominal cavity. This accident is not a serious one unless the cyst contents have undergone degeneration, as in suppurating cysts, or are irritating in character, as in the dermoid varieties. Tearing the cyst-wall will necessitate a thorough irrigation of the abdominal cavity to neutralize or to remove the contents.

650. Hemorrhage.—The site of the hemorrhage will greatly influence its character. In large cysts with extensive adhesions hemorrhage may take place from the cyst-wall or from vessels that have been torn within its walls and threaten a fatal result. The adhesions should be separated rapidly, the cyst

raised, and its pedicle secured to cut off the blood supply. The larger and more vascular adhesions should be separated between ligatures or clamp forceps. If the hemorrhage threatens life, the assistant may place his hand within the abdomen, compress the abdominal aorta, and maintain the pressure until the operation is completed. Such a procedure prevents the further supply of blood, and so arrests the bleeding. Hemorrhage may occur from a very extensive surface, particularly when malignant disease has been the subject of removal, or extensive papillary growths which are intraligamentary or behind the uterus. Fatal syncope and death may follow the removal of very large tumors as a result of decreased abdominal pressure. The vessels relieved from pressure become distended by the blood, and form extensive reservoirs, by which so much of the blood is withdrawn from the circulation as to cause cerebral anemia and the death of the patient. Such a patient can be said to have bled into her own vessels. Such an occurrence is likely to take place only in very large tumors, and may partly be obviated by emptying the cyst slowly. When syncope occurs, the head should be lowered, and an assistant may compress the abdominal aorta with the hand in the abdomen, while the treatment of the pedicle and the toilet of the abdomen proceed. Occasionally, it may be necessary to remove the uterus on account of the free bleeding from its torn and denuded surfaces. The vitality of the patient may be maintained by hypodermic injections of strychnin, gr. $\frac{1}{30}$—$\frac{1}{10}$ hourly or every two hours, a 1 : 1000 solution of adrenalin chlorid, gtt. x–xv every hour, atropin, gr. $\frac{1}{100}$, to contract the blood-vessels, or a hypodermocleisis of normal salt solution. The salt solution can be poured directly into the abdominal cavity while the patient is in the Trendelenburg posture, or transfused directly into a vein. The latter measure affords an increased quantity of fluid by which the vessels can be filled and the heart have something upon which to contract.

651. Visceral Injuries.—Injuries to the intestine are possible during complicated operations. In making the abdominal incision it is important that the peritoneum should be raised with forceps, and a small opening made, to prevent not only injury of the cyst-wall, but of a possible loop of intestine which may be adherent over it. With the opening, the incision in the peritoneum can be extended the full length of the external wound by holding it up and incising it under the eye. In very dense adhesions the intestines may be torn into, or even across, during the progress of the operation. When such a lesion occurs, the parts should be carefully repaired at once, and measures should be taken to prevent soiling the peritoneal cavity with the bowel-contents. The intestine should be care-

fully sutured, and when torn through to such a degree as to render its vitality uncertain, resection should be done and an end-to-end anastomosis made. This procedure is accomplished very quickly with the Murphy button or one of the mechanical devices for holding the ends of the divided gut, especially the O'Hara forceps. In the absence of these instruments, the anastomosis may be performed by first suturing the mesenteric surface of the bowel by a single suture, another just opposite to this, and then one on each side between the first two. This divides the bowel into four sections, each section of which can be rapidly closed by continuous suture. The needle is passed through the loop of these sutures at every other insertion, which prevents puckering and contraction of the lumen of the bowel. The first row of sutures should be covered by a second, and this also covers over the sutures we have employed to maintain the ends together. A still better procedure is to introduce an interlocking continuous suture from the mucous membrane side of the bowel, and superimpose this by a similar suture in the peritoneal covering. Such a closure is rapidly accomplished and very effective. The closure can be made with fine silk or chromic catgut, or the internal may be made with the former and the external (or peritoneal) with the latter.

The most difficult cases for suture are those in which the rectum has been torn low down in the pelvis. Portions of the bowel may be so devitalized that they will not subsequently hold, and a fecal fistula follows. In all cases in which the injury of the bowel has been extensive, and its condition endangered, the parts should be packed with iodoform gauze, which affords a vent in case union is not complete. Complete closure of the wound should be interdicted, because the patient would develop a dangerous peritonitis before the occurrence of rupture is recognized. The position and relation of the ureter should be kept in mind in tumors situated low in the pelvis, or in those which are developed in the broad ligament, and particularly in the papillary forms of ovarian growth, as the organ may be pulled up or torn off in the enucleation of such masses. When the tumor is so situated as to endanger the injury of the ureter, it is better to dissect out the latter to make sure that it is uninjured. When it has been cut or torn, the preferable procedure is to establish an anastomosis between the divided ends. (Fig. 221.) If this is impracticable, then transplantation into the bladder should be performed. If the ureter is so short as to cause its vitality to be endangered by the necessary traction, to reach the bladder the latter should be anchored to the side of the pelvis in a position most favorable to relieve the tension. The ureter may be introduced into the descending

colon or an attempt may be made to introduce its end into the ureter of the opposite side; but one should hesitate in attempting the latter, as failure means the imperiling of the unaffected kidney and ureter. Its end may be brought out through the skin and a urinary fistula established, but this means an exceedingly uncomfortable condition for the patient. One alternative is to ligate the ureter, which should be done with double ligature, as a single ligature is likely under the process of absorption to become loose and permit a subsequent leakage of urine. The urine is secreted until the pressure from the distended pelvis is equal to that of the blood pressure, when secretion no longer occurs. The organ unused becomes atrophied. Another alternative is the extirpation of the kidney, and, before attempting this, the operator should be well satisfied that the kidney on the opposite side is capable of doing the work.

The bladder may be injured during an operation. It may be drawn up over the anterior surface of the tumor and be incised, or its fundus may be removed before its true character is suspected. The peculiar interlaced muscular structure of the bladder-wall should permit its recognition. When it is opened or injured, it should be sutured. In a case of fibroid tumor in which it was my misfortune to cut away the entire summit of the bladder the walls were sutured, and the patient recovered. In such cases it is important that the bladder should be watched to prevent it becoming unduly distended during the convalescence. It should be frequently evacuated in order to avoid separation of weak union and leakage of urine.

652. Prognosis.—The result of the operation of ovariotomy will depend greatly upon the manner in which it has been conducted. With the exercise of every precaution, there will frequently be cases of delayed convalescence, owing to latent or preexisting pathologic conditions; but the danger is greatly increased when the operation has been carelessly performed and its details imperfectly practised. The operator and his assistants should have been so well trained that no deviation from the proper course, even though slight, will be overlooked. What avails the most rigid cleanliness of person, room, and instruments when a ligature is employed that has been dragged over blankets or unclean tables before its introduction? when the wound is dusted with iodoform from a box that has been standing open, and has been used in all sorts of cases about a ward? when the operator rubs his nose, scratches his head, or touches nonsterilized objects, and introduces the hand into the abdominal cavity without precautionary cleansing? Such indiscretions are often responsible for stitch abscesses and other septic processes. Pus collections and cellular inflamma-

tions in the pelvis in the region of the uterus frequently result from infection of serous collections in Douglas' pouch. Elevation of temperature, rapid pulse, and abdominal tenderness subsequent to the fourth or fifth day should lead to careful exploration for their origin. A mass of exudate in the pelvis should be considered an indication for vaginal incision, for the administration of salines until free purgation is secured, and for the use of rectal and vaginal enemata of hot water at least twice daily. The vaginal incision should be a free one across the vault of the vagina, after which the cavity should be thoroughly irrigated with normal salt solution and a good packing of iodoform gauze introduced. This procedure should be preceded by careful sterilization of the vagina.

653. Intestinal Complications.—In difficult operations inflammatory intestinal sequels are not infrequent. The intestines may be obstructed by twists, and this danger is aggravated by bands of inflammatory adhesions, or by openings in the omentum or mesentery, through which a knuckle of intestine can slip and become strangulated. Lacerations of the intestinal coat affect the peristaltic action, and may lead to paralysis of a section, with ensuing symptoms of obstruction. A twist or volvulus may become so fixed that nothing will pass it. In walls that are already weakened a fecal fistula will result. In a case some years ago in the Philadelphia Hospital an operation by a colleague was followed five weeks later by symptoms of obstruction, and the patient vomited stercoraceous material. The abdomen was reopened and five feet of intestine were torn up, disclosing a distinct volvulus, which was untwisted, when the patient recovered after a prolonged convalescence. The importance of an early reopening of the abdomen in such a case can not be overestimated, as the obstruction may be due to strangulation of a knuckle of intestine beneath inflammatory bands or to its inclosure between sutures of the wound. The latter is unlikely to occur when the wound is closed in the manner we have suggested.

654. Causes of Death.—Causes of death after ovariotomy are, as in hysterectomy, shock, hemorrhage, and peritonitis. These sequels are much less infrequent, however, as the operation for ovariotomy is more easily accomplished and the duration is shorter than in hysterectomy. Tetanus, which formerly occurred frequently after ovariotomy, is now extremely rare. Ileus may occur in the second week as a result of adhesions or twists of the intestine. Inability to accomplish the evacuation of the intestine by injections with the pelvis elevated, and especially when complicated with stercoraceous vomiting, should require the reopening of the abdomen. The

mortality of ovariotomy is very slight—much less than formerly. This is partly due to the fact that operations are now performed early, and it is only in rare instances that the patients are subject to the deleterious action of the cyst. Early operation, before the patient experiences complications, is attended with very slight mortality. Thus, Martin in more than 1000 ovariotomies has but 2 per cent. mortality; Olshausen reported his last 100 ovariotomies with only 4 deaths. The uncomplicated ovariotomy has practically no mortality.

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